$2.95
in U.S.A.

NEW
REVISED
EDITION

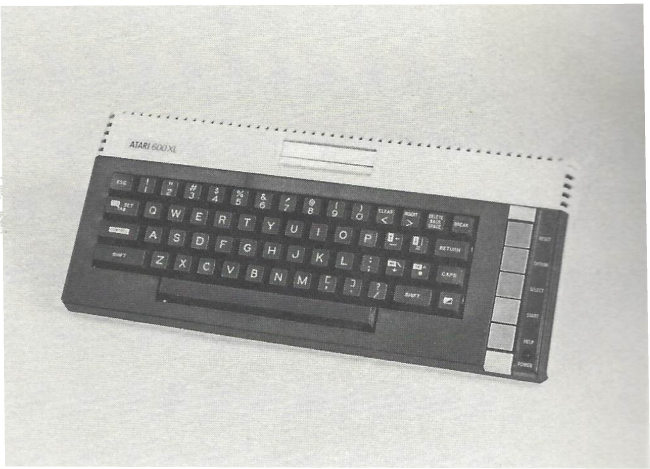
HOW TO USE
ATARI COMPUTERS

Vital information on set-up, applications, and peripherals—fully updated to include the 600XL, 800XL and 1200XL.

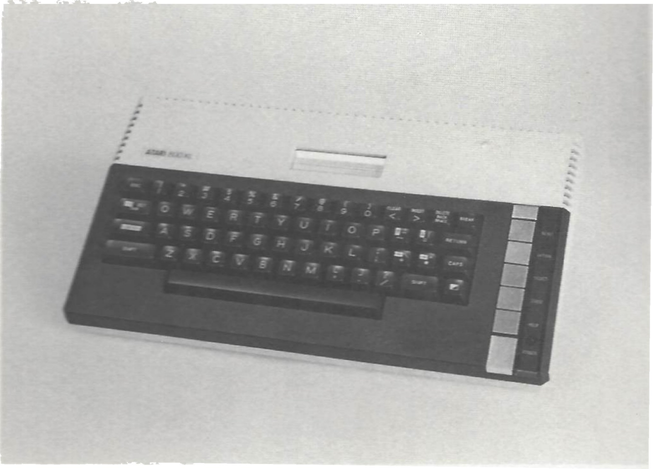
An Alfred Handy Guide

ATARI 1200XL

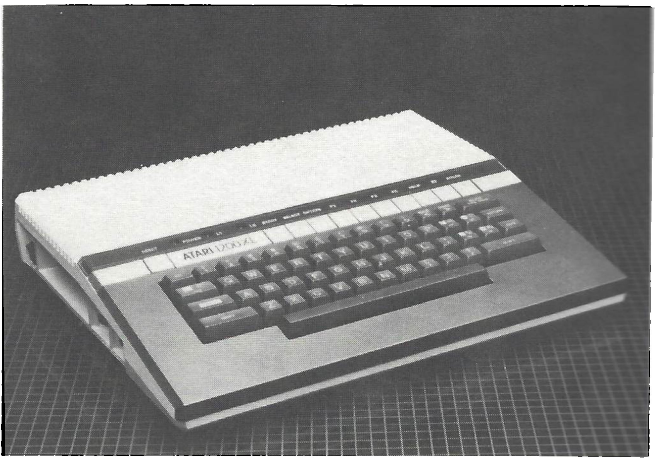
by Michael Boom



The Atari 600XL computer.



The Atari 800XL computer.



The Atari 1200XL computer.

HOW TO USE
ATARI COMPUTERS
An Introduction to the 400, 800, 1200XL, 600XL and 800XL

by Michael Boom

AN ALFRED HANDY GUIDE

Computer Series Editor
George Ledin Jr.

ALFRED PUBLISHING CO., INC.
SHERMAN OAKS, CA 91403

ACKNOWLEDGEMENTS

I'd like to express my thanks to all of the people who helped me in my research for this book, especially Gary Furr, Mindy Storch, and Roland Kato. Thanks also go to Steven Manus and Joe Cellini for their editorial help, and to Lynn Morton for general inspiration.

This Handy Guide is not a publication of Atari and should not be used in lieu of the instruction manuals that accompany their products. All information regarding Atari computers may not be accurate or completely up to date.

Editorial Supervision: Joseph Cellini

Cover Design: Paula Bingham Goldstein

Interior Design and Production: B. T. Miyake

Interior Photography: Bill Hurter

Copyright © 1983 by Alfred Publishing Co., Inc.
Printed in the United States of America.
All rights reserved. No part of this book shall be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information or retrieval system without written permission of the publisher.

Alfred Publishing Co., Inc.
15335 Morrison Street
P.O. Box 5964
Sherman Oaks, CA 91413

Library of Congress Cataloging in Publication Data

Boom, Michael
How to use the Atari computers.

(An Alfred handy guide)
Includes bibliographies.
1. Atari computerProgramming. 2. Basic (Computer program language) I. Title.
QA76.8.A82B658 1983 001.64 83-8792
ISBN 0-88284-235-8

CONTENTS

INTRODUCTION 4

1. THE ATARI HOME COMPUTERS 4
   HARDWARE 5
   SOFTWARE 10
2. RUNNING YOUR ATARI COMPUTER 12
   TAKING STOCK 12
   SETTING UP 12
   POWERING UP 13
3. USING THE KEYBOARD 14
   PREPARING THE COMPUTER 15
   TRYING THE KEYBOARD 15
   TYPES OF KEYS 17
   THE SCREEN EDITOR 26
   ARE WE DONE WITH THE KEYBOARD? 27
4. A LOOK AT BASIC PROGRAMMING 27
   LOADING BASIC 27
   ENTERING COMMANDS 28
   THE PRINT COMMAND 29
   WRITING A PROGRAM 30
   HOW THE ATARI RUNS A PROGRAM 30
   SAVING A PROGRAM ON CASSETTE 31
   SAVING A PROGRAM ON DISK 32
   ERASING THE MEMORY 33
   LOADING A PROGRAM FROM CASSETTE 33
   LOADING A PROGRAM FROM DISK 33
5. FILE STORAGE: CASSETTE AND DISK ... 34
   CASSETTES AND THE PROGRAM RECORDER 34
   DISKETTES AND THE ATARI DISK DRIVE 38
6. PERIPHERALS 43
   PRINTERS 44
   MODEMS 45
   THE ATARI 850 INTERFACE MODULE ... 46
   IMPROVING YOUR CURRENT SYSTEM .. 47
   ADDITIONAL PERIPHERALS 51
7. SOFTWARE: RUNNING YOUR COMPUTER 52
   APPLICATIONS 53
   UTILITIES 57
   COMPUTER LANGUAGES 59
   GAMES 60
   APPENDIX 61

INTRODUCTION

Welcome to the world of the home computer. They didn't exist just a few short years ago, but now they're common in many households. People use them to figure household finances, keep records, write letters and books, educate their children (or their parents!), and to play elaborate games.

This Handy Guide introduces you to the Atari family of computers: the now discontinued 400, 800, and 1200XL computers, and the new 600XL and 800XL computers (see inside front cover.) In addition, we'll examine many of the numerous products manufactured by Atari and other companies to augment these machines by increasing their power and uses.

If you want to get your computer "up and running" immediately, read Chapter 2, then jump to the Appendix for instructions to load and run programs. If you can wait, a closer look at the Atari computer system will help you better understand and control your computer.

1. THE ATARI HOME COMPUTERS

A first look at your Atari computer reveals little more than a plastic box with a typewriter keyboard. Since you have just paid good money for this helpless-looking machine, it's not surprising that your first thoughts might actually be second thoughts. It's a good time to learn or review some of the basic facts about computers.

What is a home computer anyway?! Let's look at the obvious facts first. A home computer is a machine which can perform small tasks, such as adding two numbers or displaying a small dot on a TV screen. But many machines around us are capable of doing this: a pocket calculator can add numbers; we can make dots with a pencil. What makes a computer something different?

To begin with, it can perform a wide variety of small tasks extremely quickly. This gives it the power to combine them into much larger and more impressive tasks. For instance, if the computer displays a number of small dots in the correct place on a TV screen, it can draw a complex picture (see Plate I on inside back cover). Perhaps the most important feature of the computer is that it has a memory to store lists of these small tasks. In this way, the computer has a guide to tell it which tasks to perform, and in what order. A list of these tasks is known as a *program.*

You can create your own programs for your Atari or buy programs which were written by other people to run on your machine. In computer jargon, programs are referred to as *software*, to distinguish them from the rest of the computer system, the *hardware*. You might like to think of the hardware as anything that exists physically, that you can get your hands on, and software as a set of directions which causes your hardware to run the way you'd like it to. When you buy a record for your stereo system, the music on the disk represents software; it tells the stereo how to make the sounds that you paid for. The needle, the turntable, the amplifier, and the other parts of your stereo are all hardware, waiting for the directions encoded in the grooves of the record to tell them what to do.

THE HARDWARE

Now that we know the difference between hardware and software, let's find out just what hardware is included in the typical Atari computer system. Like a stereo system, a home computer system can take many different forms depending on what peripherals you add to the Atari computer (see Figure 1.1).

The CPU

The heart of the system is the Atari computer itself. No matter which model you own, they are essentially similar except for a few important differences which we'll note later.

The Atari computer is similar to a stereo receiver because it combines many components in one package. The heart of the Atari is the *microprocessor* (or *central processing unit*, CPU), a small chip located deep inside the machine. The microprocessor is the brain and com-

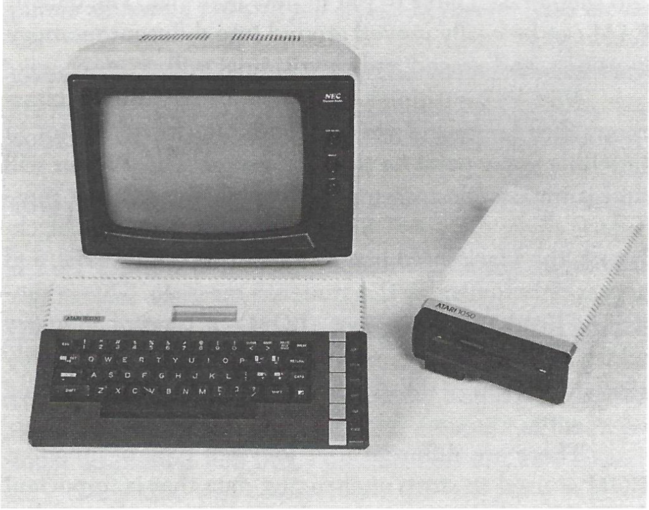


FIGURE 1.1 A typical Atari computer system: the 800XL, 1050 disk drive, and monitor.

mand center, responsible for all the calculations and figure manipulations performed by the Atari. It is in charge of executing the commands you give, and it controls all of the other parts of the computer, including other chips which display things on the TV screen, and make sounds, perform many other functions necessary to run the computer. The Atari uses a 6502 microprocessor, the same kind used in several other popular home computers.

Memory

The second major part of the computer is the *memory* required to store programs and information necessary to run the computer. These programs and information, known as *data*, are stored as tiny electric charges inside memory chips. The chips are connected to the microprocessor by tiny strips of conducting metal. We can see the plug-in memory modules where these chips are stored by lifting up the top of the Atari 800 computer.

There are two kinds of memory, *RAM* and *ROM*. These acronyms stand for *Random Access Memory* and *Read Only Memory*. To understand the difference between the two, let's think of memory as a large blackboard at school. As a teacher presents instructions and explanations to his students, he writes them on the blackboard. If he wants to present some new information, he can erase the board and write again. In a similar manner, Random Access Memory (RAM) can be filled with data and then erased later to put in new material. The data in RAM can be easily moved around into different memory locations, and erased and rewritten at will.

There are two kinds of memory, RAM and ROM. These acronyms stand for *Random Access Memory* and *Read Only Memory*. To understand the difference between the two, let's think of memory as a large blackboard at school. As a teacher presents instructions and explanations to his students, he writes them on the blackboard. If he wants to present some new information, he can erase the board and write again. In a similar manner, Random Access Memory (RAM) can be filled with data and then erased later to put in new material. The data in RAM can be easily moved around into different memory locations, and erased and rewritten at will.

Now let's imagine a student sneaking into the classroom after hours and writing something very sinister in indelible spray paint on the blackboard. The teacher will find it impossible to remove with his eraser. That message is there for good! Since it has filled up the blackboard, the blackboard is now useless for writing on, and serves only to display the student's message. This is similar to Read Only Memory (ROM), a type of memory which stores data permanently. The computer can only read the data in ROM, it cannot erase it or write anything new on it.

There are different uses for each type of memory. ROM is used to store unchanging data that is important for making the computer work. RAM is usually used to store computer instructions and information which change from time to time.

Before we leave the topic of memory, let's discuss one other aspect. Computer memory is limited. It can only remember a finite number of things, and there are ways of measuring its capacity in units. The smallest unit of memory is a *bit*, which can only remember if something is on or off. Eight bits combine to make a *byte*, which is just enough memory to store one character of the alphabet or number system. A thousand bytes are referred to as a *kilobyte*, or *K*, and a million bytes are known as a *megabyte*, or *meg*. Since different computers come with different amounts of memory, you'll usually see them advertised with these units of memory measurement prominently displayed.

The amount of memory you have in your computer determines what programs you can run. Larger portions of RAM let you run longer and more complex programs. Atari 400's and 600XL's each come with 16K of RAM. If you want to expand the RAM of the 400, it must be taken apart and a special memory board put in, which can expand its memory capacity up to 48K. The 600XL will take a memory module which plugs into its expansion bus in the back, and expands its RAM to 64K. An Atari 800 may come with anywhere from 8K to 48K of RAM, but can be expanded to 48K with plug in memory cartridges. Both the 1200XL and the 800XL come with 64K of RAM.

The Keyboard

The third and final major part of the Atari computer is the keyboard. The keyboard is our main channel of communication with the microprocessor inside. If you are familiar with typewriter keyboards, you'll see the similarities. This makes it very easy for the experienced typist to adapt to a computer keyboard. There are also a number of extra keys with little arrows and strange words on them that are used for computer functions not found on typewriters. We'll talk about how to use them later in Chapter 3.

There is a difference between the keyboards of the different Atari computers. The 800 and the XL computers all have a full-size *full stroke* keyboard. This means that each individual key can be depressed fully, which gives it the feel of a typewriter. The 400 has a *membrane* keyboard which responds to pressure on the keys, but does not let the keys sink into the board.

The membrane keyboard is smaller than the full stroke. The chief advantage of a membrane keyboard is that it is fairly kidproof, and can take a lot of abuse. Spilled drinks will not bother it, while a can of soda spilled in the keys of a full stroke keyboard can ruin it. The chief drawback of the membrane keyboard is that it is hard to type on for long periods of time, something to take into consideration if you are planning to use your Atari for word processing or entering large amounts of data. Try them out before you buy.

Now that we've seen what the computer is made of, let's look at the other hardware used to complete the system. These other pieces of hardware are known as *peripherals*.

The Monitor

The *monitor* is probably the most crucial peripheral to a system. It allows the computer to communicate with us by displaying letters or pictures on the screen. The monitor's speaker is used to create music and sounds controlled by the Atari. It also lets us see what we have typed into the computer. The Atari is designed to use your TV set as the monitor. The 800, 1200XL, and the 800XL can also use specially designed computer monitors which will give the Atari a clearer picture, but which will not tune in your favorite television programs (see Figure 1.1).

The Program Recorder and the Disk Drive

Another important peripheral is the *data storage device*. This may seem unnecessary, since we have all that memory in the computer designed to hold data. However, the RAM used to hold data has one serious problem: when

A typical Atari system uses one or both of two storage devices: the *program recorder* and the *disk drive*. The program recorder (see Figure 1.2) is much less expensive than the disk drive and works quite well for data storage. It's a specially designed cassette recorder which hooks up to the Atari. Data is converted from RAM into electrical signals, which are recorded onto a cassette tape in the same way that music or any sound would be recorded. Later, when you wish to load the data back into RAM, the program recorder plays back into the Atari the electric signals which are interpreted and stored back into RAM as the original data.

The disk drive stores data on a small piece of flexible coated plastic known as a *floppy disk* This disk is made from the same material as recording tape—mylar with an iron oxide coating—but it is a bit thicker. It gets its name from the fact that it's very flexible and not as rigid as some other disks are. (*Hard disks* are discussed in Chapter 6.) The floppy disk is enclosed in a tough, square outer envelope which protects it from creases and fingerprints, deadly enemies of the data stored on the

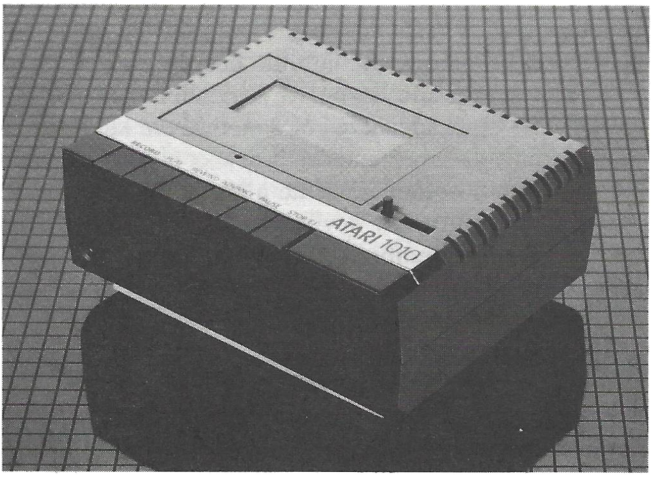


FIGURE 1.2. The 1010 Program Recorder.

disk. You can see the floppy disk through an oblong hole in the envelope, where it should never be touched. You might fingerprint it!

The disk drive (see Figure 1.1) has a recording head which moves back and forth across the disk through this hole while the disk is rotating. This recording head can record electrical signals onto the disk in much the same way that the recording head of the program recorder records onto a cassette. The contents of the Atari RAM are converted into signals which are then stored on the disk. The signals can be read back later and reconverted to data to be stored in RAM.

The disk drive's main advantages are speed and data accessibility. it can load and store data 10 to 20 times faster than a cassette recorder. It can also store and retrieve data from the disk in any order. How does that help us? Let's use an analogy. Consider trying to find your favorite song on a record album. If you have the album on cassette, you must fast forward and rewind until you find the song. This can take some time and effort, especially if the song is somewhere in the middle of the album. If you have the album on a 33 rpm record, you can look at the album jacket for its location and set the needle down directly at the beginning of the song with little searching or effort. In a similar manner, data on a disk drive can be found almost instantaneously by the record head moving across the disk. Each disk has a *directory* on it that lists (in magnetic signals) all of the programs and information contained on the disk. The computer can look at that directory and go directly to the data required.

Once it finds the data, it can load it much faster than the cassette recorder can. A long program on cassette might take 8 minutes to load (once found). The same program would load from disk in a matter of seconds. The disk drive is also more reliable, and not so likely to garble signals sent back to the computer.

Plug-in ROM Cartridges

There's a third way to store data, although unless you have special equipment you can't do it. This method is to store the data on a ROM chip as a series of circuits. Once the chip is created, the software embedded on it is generally there for good. You can buy programs stored in ROM. They usually come in a cartridge, which is plugged into an appropriate socket in the computer. The major advantage of the cartridge is that it loads instantly by plugging it in and turning the computer on, a very simple procedure. Cartridges are also very durable, and can withstand a lot of rough handling that disks and cassettes can't. The number of cartridge slots differ between Atari computers. The 800 has two cartridge slots, which allows two cartridges to run simultaneously, while the other four models have just one slot.

We've now seen the hardware included in a typical Atari home computer system: the Atari computer itself, a monitor to display information, and a program storage device (program recorder or disk drive) to store programs and information on. Although any functional Atari computer system needs at least this much hardware to get good use from it, many more peripherals can be added to increase its power and versatility.

SOFTWARE

A computer without software can't do anything. It might as well be used as a very large paperweight or converted into a very curious planter. To make it run, we need to supply it with software.

Software comes on a variety of storage media. We can buy it on floppy disks, on cassette, or on a plug-in ROM cartridge. And just as books and printed material are written in many different languages, such as Dutch or Japanese, so is software. Let's look at two languages commonly used with the Atari computer system.

Machine Language

Machine language is the internal language of the computer: all commands received by the microprocessor must be in machine language. It's a very fast and efficient language used by advanced programmers, but it's not easy to use. It's written as a series of numbers. These numbers are converted into electrical pulses which tell the microprocessor what to do. Since the numbers put into the computer speak directly to the microprocessor, the microprocessor can act very quickly on them. For this reason, most arcade style video games are written in machine language, since machine language is quick enough to provide exciting video displays. Writing a program in machine language can take a good deal of time and effort, but it can pay off.

BASIC

Since most people do not like to talk in numbers, it's fortunate that we have other computer languages that are much easier to use. In computer parlance, something easy to use is known as "friendly." One of the friendliest computer languages in use today is BASIC (which is an acronym for Beginner's All-purpose Symbolic Instruction Code). When we write a program in BASIC, we use English words to command the computer. In order to use BASIC on the Atari, we must first have a machine language program which will interpret for the microprocessor. This program takes our BASIC English commands and translates them into machine language. We will take a much closer look at BASIC programming in Chapter 4 and cover the many other languages available for use on the Atari in Chapter 7.

Atari computers are marketed with a variety of optional software. We'll look at the software most commonly included in a simple computer system.

The Operating System

One piece of software included with every Atari sold is a very important program called the *operating system* (OS for short), a machine language program which runs all of the fundamental functions of the computer. With no OS, the computer would just sit in front of you when turned on, doing nothing. The OS tells it how to respond to the keyboard and switches, how to display on the monitor, how to receive programs from the disk drive or program recorder, and thousands of other things. You must have the OS in the computer to run anything. The OS is contained in a ROM chip under the cover of the computer console. The OS begins working the instant the computer is turned on.

ATARI BASIC

The 600XL and 800XL computers have BASIC built in on a ROM chip similar to the OS ROM chip. The 400, 800, and 1200XL computers must use a plug in Atari BASIC cartridge, which plugs into the cartridge slot when you want to use it (see Chapter 4 for specifics). You must have the BASIC cartridge to run any programs you purchase which are written in BASIC. As discussed earlier, the BASIC cartridge contains a machine language program which interprets the BASIC commands for the microprocessor. BASIC is the most commonly used language among Atari owners who write their own programs.

The Disk Operating System

If you buy an Atari disk drive, a machine language program is included called the *disk operating system,* or *DOS* for short. DOS comes on a floppy disk and loads into the computer as soon as the computer is turned on. DOS gives the Atari the capability to exchange data with the disk drive, to look at the disk directory, and to control the drive motor. Without DOS, you can't use a disk drive. Cassette owners without disk drive need not worry about DOS, as it has nothing to do with the program recorder.

This is the software common to most Atari computer systems. There is an incredible amount and variety of additional software available to make your Atari perform all sorts of interesting and useful jobs. We will look at some of it in Chapter 7.

2. RUNNING YOUR ATARI COMPUTER

Setting up and running an Atari computer system is not a difficult job. The only tool you'll need is a screwdriver. Just follow the instructions in the owners manual of whichever model you own.

Before you start hooking things up, take a look around you for a good place to set up. You'll want a table or desk where you can sit down at the computer as if it were a typewriter. There should be room for the disk drive or program recorder nearby, and the monitor should be close for easy viewing. If your monitor is small enough (perhaps a 13-inch screen), you might set it up directly behind the computer. If it's a large console TV, set your computer table in front of it at a close enough distance for easy viewing. You'll find that the cables connecting all of the peripherals will set some limits on their distance.

TAKING STOCK

You should have:

A TV switch box

A power supply

An owner's guide

The computer itself

The XL computers each have a detachable cord with the TV switch box.

SETTING UP

If everything is there, first hook the computer up to your monitor or TV set, then plug in the power cords, carefully following the instructions in your owner's guide.

Once everything is connected, trip the rocker switch labelled POWER on the side of the computer to test whether the computer and monitor work. If there are no cartridges in the cartridge slots, the Atari 400 and 800 will display the message ATARI COMPUTER—MEMO PAD in white on a blue background. The 1200XL will display a rainbow-hued Atari symbol on a black background. The 600XL and 800XL will display a simple "READY" in white on a blue background. If nothing shows on your screen, check to make sure the channel is set correctly on your Atari and the TV set. (The TV might also need some fine tuning.) If things still don't work, consult your dealer for help.

Now that we know the computer and monitor work, we can turn them off and hook up our program storage device. Again, follow the appropriate instructions in your owner's guide to connect either your program recorder or disk drive.

At this point you are ready to power up, but if you're going to play games, you'll probably want a joystick, set of paddles, or other game controllers. You can buy them at almost any computer or video store. Located under the front keyboard of the 400 and 800 computers is a row of jacks labelled CONTROLLER JACKS, numbered 1 to 4. On the left side of the 1200XL and the right side of the 600XL and 800XL are two controller jacks numbered 1 and 2. Just plug in the cord from the end of the game controller into jack #1, and you're ready to go. If you need to use more game controllers, plug them into the remaining jacks in numerical order.

POWERING UP

Now that the system is all hooked up, it's time to turn it on. Although it seems that all you have to do is turn on a few switches, it's not quite that simple in some cases. When you use the disk drive with a system, a certain power up procedure has to be followed to make the system work.

Powering up is easy if you are not going to use the disk drive. Just turn on the monitor and the computer, and you're ready to go. Be sure the cartridge door is closed on the 400 and 800 computer, since an open cartridge door automatically turns the computer off. The program recorder doesn't need to be turned on since it works only when you press the PLAY, ADVANCE, and REWIND keys, and is turned off when none of these keys are depressed.

When you're using the disk drive however, a certain order has to be followed in powering up. This is because of DOS, the Disk Operating System we discussed in Chapter 1. It's a machine language program which must be loaded into the computer so that your Atari can run the disk drive. A diskette labelled Master Diskette should be included with your disk drive. This is the disk that contains DOS. If we need DOS so that the Atari can use the disk drive, how can we load DOS from the diskette which must be loaded from the disk drive?

Fortunately, there is a solution which lets the computer take care of this, pulling itself up by its own bootstraps. When the computer is turned on, it has a small program in its own memory which sends out a signal through the data cable to see if there's a disk drive attached to the computer, and if that disk drive is turned on. If there is a powered-up disk drive on the line, this small program automatically looks for DOS on the disk inserted in the drive and loads it into the computer. This is called *booting up* or *booting DOS*. You can see that if there is no powered-up disk drive with DOS in it when you turn on the computer, DOS will not be booted.

Now make sure the computer and all the peripherals are turned off. This is how to power up the Atari computer system with a disk drive attached:

1. Turn on the disk drive. You'll hear some whirring mechanical sounds, and see two red lights come on. After a few seconds, the whirring will stop, and the upper red light (the "BUSY" light) will go off.
2. After the BUSY light is off, be sure the front latch of the disk drive is up, or the front door is open.
3. Remove the diskette marked "Master Diskette" from its envelope, and insert it with the label up, towards you, on the right side. Be very careful not to touch the diskette inside the black outer sleeve. Push the diskette into the drive until you feel a slight click. You shouldn't have to force it.
4. Close the disk drive door or latch. If it won't close easily, make sure the diskette is pushed all the way back into the drive.
5. Turn on the monitor.
6. Turn on the computer. You should see the BUSY light go on and hear the whirring of the disk drive. If the sound is turned up on the monitor, you'll hear a fast beeping sound, which is DOS being loaded into the computer. After DOS is loaded, you'll see some printing come up on the screen headed: "Disk Operating System" or "Atari DOS." This is called the DOS menu. If you have the BASIC cartridge inserted, or you're using a 600XL or 800XL, then the screen will just say "READY". Congratulations! Your computer system is now up and running.

If, for some reason, you see BOOT ERROR repeating itself endlessly on the monitor, something is going wrong, and the computer cannot find DOS. Turn the computer off, and wait for the BUSY light to go off on the disk drive. Check to make sure the diskette is inserted properly. If it is, make sure the door is closed, the data cable is securely connected at both ends, and the disk drive is turned on. Try powering up once more.

If you have a cartridge in the computer, you won't see the DOS menu. Instead, the cartridge program will start running. If you want to see the DOS menu without having the cartridge run first, you must take the cartridge out and power up once again.

3. USING THE KEYBOARD

We know from our look at Atari hardware in Chapter 1 that the heart of the Atari computer is the microprocessor, a small chip located inside the computer. The keyboard lets us communicate with the microprocessor. Each time we press a key on the keyboard, a character appears on the screen and is also sent to the microprocessor (in machine language). When the microprocessor communicates with us, it does so by printing messages on the monitor. Let's imagine the monitor screen as a bulletin board where we post messages for the microprocessor to read, and it in turn posts messages for us. In Chapter 1, we also talked about the Operating System, a machine language program that's always in the computer, running everything. There's a special part of the Operating System that keeps track of our bulletin board and lets us exchange messages with the microprocessor. This part of the OS is called the *screen editor*. In order to talk to our computer, we need to know the rules by which the screen editor works.

The Atari computers all use the same screen editor. However, the XL computers have a few extra keys, and the layout is a little different.

PREPARING THE COMPUTER

We're going to test out the keyboard, play with it, and get familiar with the operation of the screen editor as it works using BASIC. To enter BASIC mode, just do the following:

1. Turn on the monitor.
2. If you have a 400, 800, or 1200XL computer, plug the BASIC cartridge in the cartridge slot (left slot on the 800). 600 XL's and 800XL's don't need the BASIC cartridge, since it's built in.
3. Turn on the computer.

If you have a disk drive, be sure to leave it turned off. If you have a 400 or 800 and don't have a BASIC cartridge, just skip step 2. You'll enter Memo Pad Mode, which will work just as well for our keyboard experimentation.

As we play with the keyboard in BASIC mode, the computer will expect logical commands and see what we're typing as jibberish. It will probably complain with ERROR messages. Ignore them for now, and just avoid using the RETURN key if they bother you.

TRYING THE KEYBOARD

The best way to find out about the keyboard is to try it out. Go ahead! Type anything at random. If you would like, try all the different keys to see what they will do. You won't hurt anything on the computer. If, for any reason, the computer *locks up*, meaning it won't respond to the keyboard, just hit the SYSTEM RESET or RESET key located in the upper right-hand corner of the computer (upper left hand corner of the 1200XL.) If all else fails, you can simply turn the computer off and then on again.

You may notice several interesting things. For instance, if you hold most keys down for longer than a second or two, they will begin repeating the character or function they represent on the screen. If you happen to leave the keyboard for more than about eight minutes, you'll notice that the colors on the screen will start changing automatically. The Atari does this to protect your monitor from color burnout. You can make it stop the color cycling by pressing any key on the keyboard. You may also notice strangely shaped characters, or characters that seem to be the inverse of the other characters. These will have to remain mysteries until our keyboard exploration later in this chapter.

One very important thing to notice is the small white square that moves around the screen as you type. It seems to act as the type head, leaving characters wherever it is positioned. This small square is called the *cursor*, and it appears on the screen to let you know where you are typing. You'll notice that if you type to the end of a line, the cursor automatically jumps back to the left and down one line. You don't need the RETURN key to do this, as you would on a typewriter. This is called *wraparound.*

Moving the Cursor

Because you can move the cursor without printing characters on the screen, you can use it to move easily to another screen area where you wish to type. This is how to do it. On the left edge of the keyboard, you'll notice a key marked CTRL or CONTROL. Hold this key down, then simultaneously press one of the keys on the right marked with small arrows in white squares. You'll notice the cursor jumps one space in whatever direction the arrow was pointing. If you hold the arrow key down, it will repeat, moving the cursor across the screen. When the cursor hits one side of the screen, it will automatically jump to the opposite side, and continue moving in the arrow's direction.

You will notice that if the cursor passes over characters already on the screen, it doesn't erase them. Instead, it just passes over them, turning them momentarily into a blue character on white background instead of white on blue. This is called an *inverse* character. If you locate the cursor on top of a character and then begin typing new characters, the old character will be erased and replaced with a new character. Try it out.

Clearing the Screen

If you begin to type at the bottom of the screen and run out of room, you'll notice the Screen Editor automatically shifts all the characters up on the screen to give you more room to type. The lines at the top of the screen are pushed upwards out of sight. This is called *scrolling.* If you want

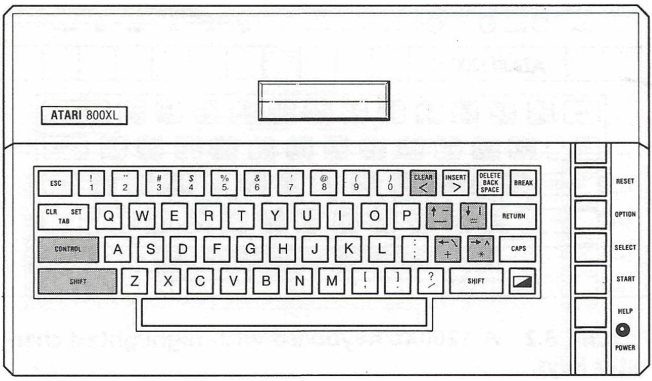


FIGURE 3.1 An 800XL keyboard with the CTRL, cursor movement, SHIFT, and CLEAR keys highlighted.

to start fresh and clear out the screen, hold down the SHIFT key, located both in the bottom left and bottom right corners of the keyboard, and then press the CLEAR key on the top row toward the right (see Figure 3.1). Everything on the screen will be erased, and the cursor will be placed at the top left corner of the screen.

TYPES OF KEYS

Now it's time to take a close look at the keyboard and the individual keys to find out what they do. We'll divide the keys into four different types in order to understand them better. They are:

1. **Character keys.** These keys produce characters on the screen when pressed.
2. **Editing keys.** These keys don't actually produce characters when pressed, but move the cursor around, clear the screen, shift characters around on the screen, and perform other editing functions.
3. **Programming keys.** This is a small group of keys that are used mainly to perform special tasks when programming.
4. **Program control keys.** These keys are sometimes used when running a program to control the program.

Character Keys

Character keys (see Figure 3.2) are the simplest keys to understand. They are the letters, numbers, punctuation, and special mathematical symbols which appear on the keys in the middle of the board. You press a character key and a character appears on the screen. The long space bar at the bottom of the keyboard is also a character key which produces only a space as its character. Some character keys have more than one symbol on them, such as the number keys in the top row of the keyboard and the cursor movement keys to the right. These multiple-character keys are used with the SHIFT and CTRL keys.

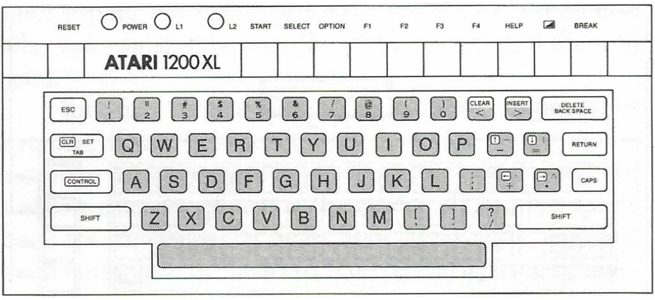

RESET
POWER
L1
L2
START
SELECT
OPTION
F1
F2
F3
F4
HELP
BREAK
ATARI 1200XL
ESC
CLEAR
INSERT
DELETE BACK SPACE
CLR SET TAB
RETURN
CONTROL
CAPS
SHIFT
SHIFT

FIGURE 3.2 A 1200XL keyboard with highlighted character keys.

Editing Keys

The editing keys are generally located to the right and left of the keyboard (see Figure 3.3). Let's look at them one at a time.

SHIFT Keys The SHIFT key lets us get a second character from most of the keys. There are two SHIFT keys, one in each lower corner of the keyboard which do the same thing. By pressing SHIFT and a two-symbol character key simultaneously, you get the upper character to display on the screen. For instance, pressing the SHIFT and the 3 key together produces a # on the screen. Using SHIFT with a three-symbol key gives you the upper right symbol. For example, pressing the SHIFT with the * key yields a ^. If you are used to using the typewriter, you know that a typewriter's shift key gives you capital letters. Why doesn't it do the same thing on the Atari keyboard? It's time to look at our next key.

CAPS (or CAPS/LOWR) Key By now, you've probably noticed that the letters produced on the screen are all upper-case (capital) letters. The CAPS key gives us lower-case letters as well. Press it once. Now try typing letters onto the screen. They're all in lower case! As long as the keyboard is in lower-case mode, the SHIFT key will give us capital letters if pressed simultaneously with any of the letter keys. One important thing to notice is that the CAPS key only affects the letter keys (see Figure 3.4).

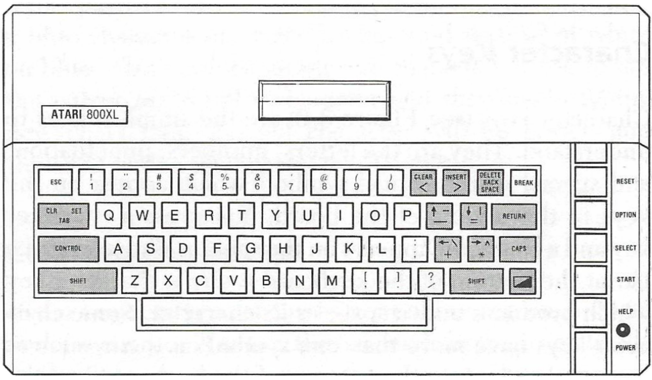

ATARI 800XL
ESC
CLEAR
INSERT
DELETE BACK SPACE
BREAK
CLR SET TAB
RETURN
CONTROL
CAPS
SHIFT
SHIFT
RESET
OPTION
SELECT
START
HELP
POWER

FIGURE 3.3 An 800XL keyboard with highlighted editing keys.

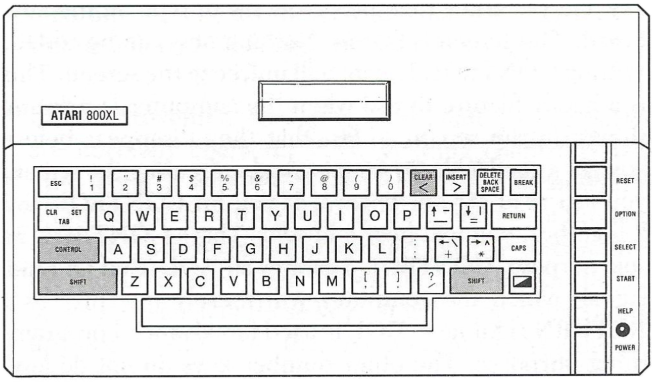


FIGURE 3.4 An 800XL keyboard with CONTROL, SHIFT, and CLEAR keys highlighted.

The two- and three-symbol keys work just as they had before. To put a # on the screen, we still have to press SHIFT and 3 together whether we are in upper- or lower-case mode. To return to the upper-case mode on the 400 and 800 computers, press SHIFT and CAPS/LOWR together, and the keyboard once again produces only capital letters regardless of the use of the SHIFT key. To do the same thing on the XL computers, just press the CAPS key a second time to return to upper-case mode. You do not need to use the SHIFT key with it.

CONTROL Key (or CTRL on the 400 and 800XL) The CONTROL key is like a second SHIFT key. It gets a third set of characters out of many keys. Try it out. Hold the CONTROL key down while typing the letter keys. You should get some strange results! The figures you see on the screen are called *graphics characters*. You can use graphics characters as building blocks to draw pictures of things if you wish. You'll notice all sorts of shapes, including hearts, clubs, diamonds, and spades for card playing. Since the graphics symbols are not shown on the keys, you should look in your owner's manual to see their location on the keyboard.

In addition to the graphics characters, the CONTROL key gives us the upper left-hand symbol of a three-symbol key. We have already seen how this works by moving our cursor around. For example, pressing CONTROL and + moves our cursor one space to the left, the direction of the arrow in the upper left of the key.

Another useful bit of information about the CONTROL key is that it can be locked into use as the SHIFT key was, using the CAPS key. Hold the CONTROL key down and press the CAPS key once. Now try typing on the letter keys. The graphics characters appear without holding down the CONTROL key! Locking the CONTROL key with the CAPS key works only on the keys controlled by the lower-case mode; that is, the letter keys (shown in Figure 3.4). To return to the normal upper case mode, press CAPS again. On the 400 and 800 computers, you must press both CAPS/LOWR and the SHIFT key together to get back to upper case mode.

Using the CONTROL key with the number keys can yield some interesting results. Hit the CONTROL key and the 1 key together. Now try to type on the keyboard. The screen is frozen! Nothing new can be added. Hitting CONTROL 1 again will unfreeze the screen. This is a handy feature to use when the computer is printing things on the screen so fast that they disappear before you get a good look. By freezing and unfreezing the screen, you can read at your leisure. If you hit CONTROL and 2 together, you will hear a buzzer. That's CONTROL 2's sole purpose. CONTROL 3 creates an EOL (End Of Line) signal, which the computer will merely interpret as a RETURN right now. EOL is used for advanced programming purposes. The other number keys do not do anything when used with CONTROL.

The Inverse Key (◪) This key is located in the lower right hand corner of the 600XL and 800XL keyboard, and to the right of the chrome keys at the top of the 1200XL. On 400 and 800 computers, the inverse key is marked with a JIL, and is sometimes referred to as the Atari key. It's located next to the lower right hand SHIFT key. Hitting the inverse key once causes all the characters to be printed in inverse video, which is a kind of negative image. Try it out. It even works with the graphics characters. To get back to regular characters, press the inverse key once again.

The RETURN Key On a typewriter, the RETURN key usually serves as a carriage return, ending the line you are typing on and returning to the left side of the page, one line lower. The RETURN key on the Atari will do this on the screen, ending the line and returning to the left, but it is not really like the typewriter return key. Think of the RETURN key as a message to the computer saying "I'm done typing, I'm returning control to you so you can read my message." In Memo Pad Mode, the computer doesn't read the message, but when you use BASIC, you'll see how RETURN works in this way.

TAB/SET/CLEAR Key This key is really three keys in one. Pressing the key alone will work the TAB function. Pressing it with SHIFT will work the SET function, and pressing it with CTRL will work the CLR function. TAB works as the tab on a typewriter does. When you press it once, the cursor jumps to the right a set number of spaces, then stops. Press it again and it will jump to the right once more. These stopping places are called, logically enough, *tab stops*. You can continue this until the cursor returns to the left side of the screen, where you can start all over. TAB gives you the ability to get to the center of the screen easily.

Although tab stops are preset when you turn on the computer, you can move them wherever you like. To do this, move the cursor to the spot on the line where you would like a tab stop. When it is there, use the SET function by pressing the SHIFT and TAB.

To clear out a tab stop, use the TAB key to move the cursor to the tab stop you want to get rid of, then use the CLR function by pressing the CTRL and TAB keys together. The next time you use the TAB function, the cursor will no longer stop there.

Cursor Movement Keys (→, ↑, ←, and ↓) These keys are normally character keys, yielding characters when used alone or with the SHIFT key. Using them with the CTRL key moves the cursor in the direction of the arrow without disturbing the characters on the screen which the cursor crosses over. When the cursor hits the edge of the screen using these keys, it will wraparound (jump) to the opposite side, then continue its movement.

DELETE/BACK SPACE (or DELETE/BACK S) Key This is a triple-function key, which lets us remove characters from the screen. Hitting the DELETE/BACK SPACE key alone will move the cursor one space to the left (backwards), erasing whatever character is under it. This is the BACK SPACE function. You can use BACK SPACE to erase something you just typed.

The DELETE function on the top of the key can be used with either the SHIFT or CONTROL keys with different results. SHIFT DELETE will cause the whole line that the cursor is resting on to disappear. All the lines underneath the cursor will then jump up one line. CONTROL DELETE will cause one character, the one under the cursor, to disappear. All the other characters to the right of the cursor will then move over one position to the left. If you hold the DELETE key down for a while, the key repeat will start, and you can delete a lot of characters. The best way to understand how this key works is to type a lot of characters on the screen and then move the cursor back into the midst of them. Try this key by itself, then with the CONTROL and SHIFT keys.

INSERT Key This key is part of a character key. The INSERT function only works when you press it with CONTROL or SHIFT. Think of the INSERT function as the opposite of DELETE. If you press SHIFT INSERT, all the lines below the cursor will be pushed down one line, and a blank line will appear where the cursor is. You can then use the blank line to type in whatever characters you want. CONTROL INSERT will insert one space by shifting the characters under the cursor and to the right of it one position to the right. Try this key out in the same way you tried DELETE/BACK SPACE.

CLEAR Key This key is also part of a character key. The CLEAR function works the same with either the SHIFT key or the CONTROL key. Pressing SHIFT CLEAR or CONTROL CLEAR will erase everything from the screen and return the cursor to the upper left-hand corner.

Programming Keys

The programming keys (see Figure 3.5) are usually used when writing or running a program, but let's take a look at them now.

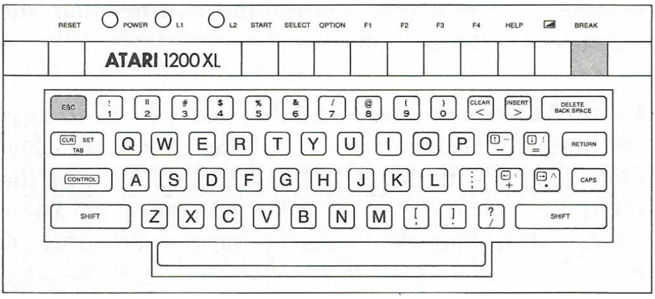


FIGURE 3.5. 1200XL keyboard with highlighted programming keys.

ESC Key This key (short for "escape key") tells the Atari to ignore the next editing key pushed, and to print a special symbol representing that editing function instead. Press ESC once, then press DELETE/BACK SPACE. You will see an arrow representing BACK SPACE appear on the screen, but no actual back space will happen. This works with the editing functions as well, such as CLEAR and INSERT. It even works with the ESC key itself! Try pressing ESC twice. Note that this key doesn't work with RETURN, SHIFT, CONTROL, CAPS, the Atari key, and BREAK.

BREAK Key The BREAK key is used to tell the computer to stop what it is doing. (No, it does not break the computer.) You can use it when the computer is busy running some program that you want stopped, either to change something in the program or to load a new program entirely.

Program Control Keys

On the 400, 800, 600XL, and 800XL computers, there is a vertical row of keys to the right of the keyboard (see Figure 3.6). These are the program control keys. On the 1200 computer, these keys are part of the strip of chrome keys at the top of the keyboard. These keys are:

START
SELECT
OPTION
RESET (or SYSTEM RESET)
HELP (only on the XL computers)

The START, SELECT, and OPTION keys are not useful to us yet, because their different functions are dependent on a program running. START might be used to start a game for instance, or perhaps to make the program calculate something. SELECT might choose between different versions of the program. The point to remember now is that these keys have no set function, and quite often do not apply to running a specific program. Check the instructions of any program you buy to see if they use the START, SELECT, or OPTION keys. SYSTEM

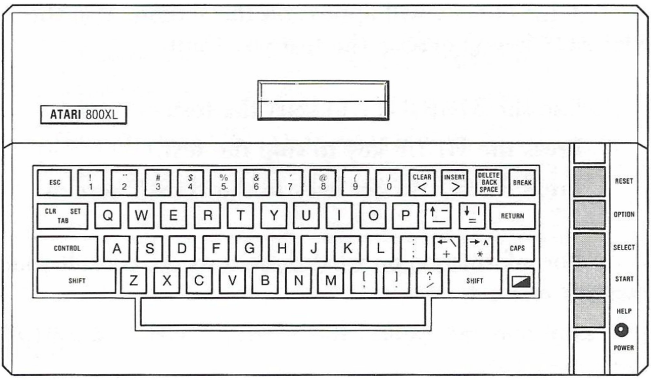


FIGURE 3.6 800XL keyboard with highlighted program control keys.

RESET is a type of emergency button. Pressing it stops all activity in the computer, sets everything back to normal, and starts the computer running as if it had just been turned on. The big difference between hitting SYSTEM RESET and turning the computer off and then back on again is that SYSTEM RESET does not erase a program in the computer's memory. Turning the computer off and on again would wipe the memory clean. Try SYSTEM RESET now. The screen will be wiped clean, and READY will appear. If you were typing in inverse or lower-case letters, the keyboard will now be reset to normal upper-case letters. Use SYSTEM RESET for emergencies when the BREAK key will not work.

ADDITIONAL FEATURES OF THE XL COMPUTERS

The Atari XL computers have several features that the 400 and 800 computers don't. These features expand the power of your keyboard and computer.

The Help Key

Like the other program control keys, the HELP key doesn't really do anything unless it's been programmed to make it work in one way or another. Atari included it as an extra key to be used with some software to produce explanations and helpful hints when pressed.

The Self-Test Function

XL computers run some simple tests on themselves whenever they're turned on, to see if everything is working properly. You can also have them perform more extensive diagnostic tests if you wish:

Type BYE then hit RETURN

If you have a 1200XL, you'll get a rainbow Atari on the screen. Press the HELP key to go on.

A list of tests will appear on the screen. Use the SELECT key to choose the test you want.

Use the START key to start the test.

Press the HELP key to stop the test.

Press RESET to get back to the BASIC screen.

For information on what these tests do, consult your owner's manual.

International Character Set

In the previous description of the CONTROL key, we learned how to produce graphics characters by using the CONTROL key with the character keys. The XL computers give us the option of creating international characters on the monitor instead of graphics characters. Here's how to select the international character option. Type:

```
POKE756,204
```

Hit the RETURN KEY.

Now try using the CONTROL key with character keys. You should get the international character set, which you can use for special characters needed in German, Spanish, Swedish, and other European languages.

To get back to graphics characters, type:

```
POKE756,224
```

Hit the RETURN key.

You'll notice that all the international characters on the screen immediately changed to graphics characters. You can't mix graphics and international characters on the monitor.

ATARI 1200 FUNCTION KEYS

The Atari 1200 XL has 4 extra keys not found on other Atari computers. These are called *special function keys*, and can be found on the strip of chrome keys at the top of the console, labelled F1, F2, F3, and F4.

They can be used by themselves, with the SHIFT key, or with the CONTROL key. By themselves, they are cursor movement keys, doing the same thing as CONTROL and the cursor movement keys on the lower keyboard. Using the special function keys saves the effort of Moving the cursor this way saves the effort of pushing down two keys simultaneously. This is what they do:

F1: Cursor up

F2: Cursor down

F3: Cursor left

F4: Cursor right

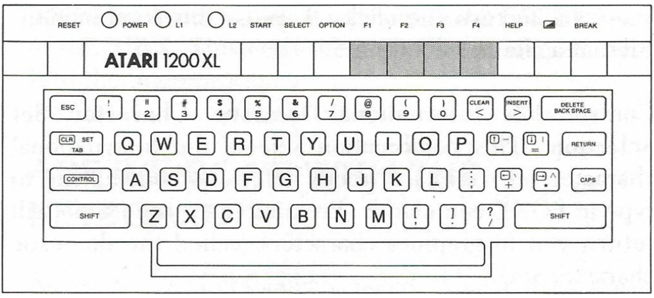


FIGURE 3.7 Highlighted Atari 1200XL function keys.

Using the special function keys with the SHIFT key moves the cursor also, but in large leaps. SHIFT and:

F1: Cursor to top left of screen
F2: Cursor to bottom left of screen
F3: Cursor to left of current line
F4: Cursor to right of current line

The special function keys used in combination with the CONTROL key provide four very useful functions. Since these functions are a little more complex, each is covered below in more detail.

Control F4: Keyboard Disable/Enable Pressing this combination once turns off the keyboard, so that pressing the keys has no effect on the computer. This is a handy function if you have to leave the computer in the middle of some work and don't want others to meddle with what you have in the computer. To turn the keyboard back on again, press CONTROL F1 a second time. The light labelled L1 above the chrome strip will come on when the keyboard is disabled so you will know why nothing is happening at the keyboard.

Control F2: DMA Disable DMA stands for Direct Memory Access, but you don't really need to know that. What this combination does is to blank the monitor screen. This could come in handy if yu've been typing something embarrassing on the computeer and somebody walks into the room who shouldn't see it, but its real purpose is to speed up the computer. If the microprocessor has a lot of calculations to do, it can do them much faster if it does not have to keep telling the monitor what to display on the screen. Hitting CONTROL F2 allows these calculations to run much faster. Hitting any other key on the keyboard except for BREAK, SHIFT, or CONTROL will return the screen display. Using the HELP key seems to work the best, since it does not add any character to the screen.

Control F3: Key Click Disable/Enable Every time you press a key on the keyboard, a click comes out of the monitor speaker if you have the volume turned up. This lets you know the key has been pressed all the way. If you want to turn the click off, press this combination. Press it again to turn it on.

Control F4: International/Domestic Character Set Selection This combination selects the international character set we talked about before without having to type in POKE commands. Pressing it a second time will return you to graphics characters (called the domestic character set).

This concludes our examination of the keyboard. Before we move on to the next chapter, there are a few things we need to know about the screen editor.

THE SCREEN EDITOR

You may have noticed earlier that the screen editor does some unexpected things. For instance, it occasionally buzzes at you while you type. If you use SHIFT DELETE to delete a line, it may delete several lines instead. What's going on?

When we look at the screen, we see characters in distinct lines and columns. The screen editor sees things differently. What we see as one line, it may see as merely part of a longer line. To differentiate between our line and the screen editor's line, we need to name two different kinds of lines. They are the *physical line* and the *logical line*. The physical line is what we see, the logical line is what the screen editor sees.

Let's go back to our conception of the screen as a bulletin board used to pass messages back and forth between us and the microprocessor. When we want to send a message to the microprocessor, we type it on the screen, then hit RETURN to tell it to read what we just typed. If we've been typing other things before the message, we don't want them included in the message. The screen editor works this out by requiring a RETURN after each message. This RETURN marks the end of one message and the beginning of the next.

When we send messages to the microprocessor, we have to keep in mind that we are dealing with a simple silicon chip, not a human mind. It can't handle a message that is too long. The screen editor works this out by limiting messages to three physical lines in length. This message is called a logical line.

Now some things become clear. When the computer buzzes at you, it's because you are eight characters before the end of a logical line, which can be only three physical lines in length. Pressing SHIFT DELETE deletes a logical line, not a physical line. When the logical line is longer than one physical line, then all of the physical lines included are deleted.

Keep in mind that a logical line can be as short as one character or as long as three physical lines. Hitting RETURN determines its length. If when you are typing a message, you realize that you've made a mistake and don't want it sent to the microprocessor, hit BREAK instead of RETURN. This ends the logical line without sending it to the microprocessor.

ARE WE DONE WITH THE KEYBOARD?

Not quite. One fact should be noted. What we have learned about the keyboard is the way it usually works. Occasionally you may buy a program that causes the keyboard to work differently. This is usually done to make the program easier for you to use. Be sure to read the program directions carefully. Now—let's move on to programming!

4. A LOOK AT BASIC PROGRAMMING

BASIC programming is a subject that has filled many books. We're not going to be able to gain any kind of comprehensive knowledge of BASIC in one chapter of a Handy Guide. Instead, our object will be to understand the fundamental structure of BASIC programming. We'll learn a few of the commands available and how to enter them, concentrating on the commands that let us load and save programs using an external storage device such as a cassette recorder or a disk drive.

BASIC is a computer language that was originally developed by John Kemeny and Thomas Kurtz at Dartmouth College in the mid-sixties. Designed specifically for beginning computer programmers, it is particularly clear and easy to use, and found on almost every microcomputer sold today. Although BASIC has developed many dialects—new commands have been added an old commands revised—its fundamental structure remains the same. The new versions adapt it to the strengths and peculiarities of many different computers.

There are two versions of BASIC available from Atari. One is Microsoft BASIC, a version used on many microcomputers, including the Apple II. The other, written especially for the Atari, is known appropriately enough as Atari BASIC. We will talk about Atari BASIC in this chapter.

Loading BASIC

Atari BASIC for the 400, 800, and 1200XL comes on a plug-in ROM cartridge. Open the cartridge door on the Atari 400 and 800 computers and plug it in the appro-

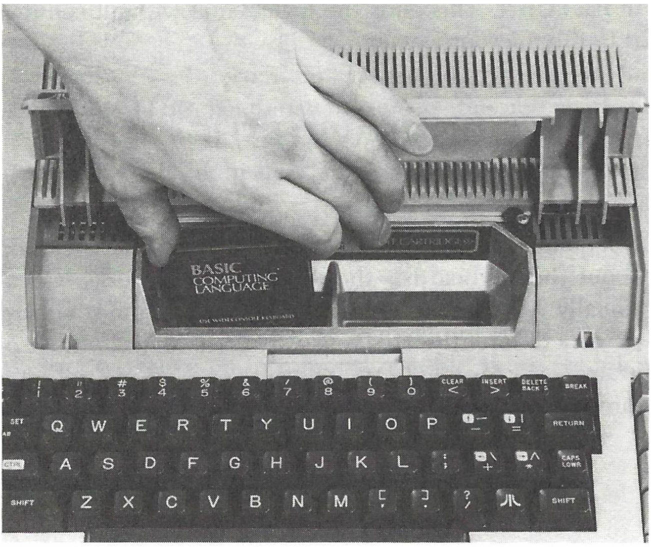


FIGURE 4.1 Load the Atari BASIC cartridge in the left-hand slot of the Atari 800.

priate slot. There is only one cartridge slot on the Atari 400, but there are two on the 800. Make sure you insert it in the left-hand slot (see Figure 4.1). The 1200 has a cartridge slot on the left side where you don't have to open a cartridge door. Just plug the cartridge in. Now power up the system as discussed in Chapter 2.

The 600XL and 800XL computers don't need any BASIC cartridges, since BASIC is built into the computer.

ENTERING COMMANDS

We've been talking quite a bit about commands. Now it's time to find out exactly what they are. BASIC commands are usually English words whcih cause the computer to perform specific functions. Some of the BASIC commands we'll learn about in this chapter are:

- PRINT
- SAVE
- RUN
- LIST

There are a few very important things you should know about Atari BASIC commands. As you can see, they are typed in capital letters. They can't be typed in small letters, nor can they be typed in inverse letters. Spelling counts! The computer is not a person who might guess what you mean if you type PRENT instead of PRINT. The slightest misspelling will confound the computer, and it will respond with an error message.

As mentioned in the last chapter, we give commands to the computer by using the screen as a kind of message board. The computer tells you when it is ready for a command by printing READY on the monitor. We give it a command by first typing the command on the monitor and then entering it by hitting the RETURN key. There should be a READY on the screen now. Let's give the computer a command. Type the command BYE. If it's misspelled, you can go back and correct it. Once you're ready to enter the command, hit RETURN. You should now be in the Memo Pad mode, the Atari rainbow display, or the Help Menu, depending on your computer model. The computer has acted on your command, BYE, which lets you leave BASIC. To get back to BASIC, hit the key.

If you did something wrong, misspelled a word perhaps, then you probably got an error message from the computer. This is the computer's way of saying that it did not understand what was entered. The Atari scans your command character by character. When it reaches a character that does not make sense to it, it marks it with an inverse character, then reprints your faulty command on the monitor. This means you'll have to find out what you did wrong and re-enter your command.

If the computer knows of some specific error that was made, it will also give you an error number with your error message. You can look up the number in the inside cover page of the *Atari BASIC Reference Manual*, (a comprehensive book sold by Atari), or page 13 of the *Atari BASIC Reference Guide* (which comes with XL computers.) Error messages can be annoying, but without them, we would never know what we did wrong when the computer won't respond to our commands.

THE PRINT COMMAND

A very important BASIC command is PRINT, which tells the computer to print characters of your choosing on the screen. Let's try it out. First type in the command PRINT. Follow it with a space, then a double quote ("). Now type in anything you want, perhaps something like:

```
PRINT "COMPUTERS CAN'T THINK,
AND I'M GLAD."
```

When everything looks right, hit the RETURN key to enter the command. Your Atari should print out the message enclosed in quotes.

PRINT can also be used to calculate arithmetic expressions. Try entering this (notice there are no quotes):

```
PRINT 56+34
```

The Atari will respond with 90, the correct answer to 56 + 34. In computerese, it has just *evaluated* the arithmetic expression 56 + 34. Now try:

```
PRINT "56+34"
```

The Atari will print 56 + 34, which are the characters in the quotes. It won't evaluate the expression.

This is an important rule regarding PRINT: Anything following PRINT in quotes will be printed out exactly as you entered it. Any expression not in quotes will be evaluated and the result printed out. PRINT can make your Atari into a very powerful calculator. You can evaluate complex expressions like (2+67)*45/42. Experiment and see what you can do.

WRITING A PROGRAM

Thus far we have been using BASIC in the *immediate mode*. We type in a command and enter it using RETURN, and the computer executes the command immediately. If we want the Atari to do anything more than one simple command at a time, we have to use the *deferred mode*. In the deferred mode, we can enter a long list of commands in the order we want the computer to execute them. These commands will be stored in the computer's memory, and will be executed in order at a later time.

This is how a command is entered in the deferred mode. First type in a number. It has to be a positive integer from 0 to 32767; no negative numbers or fractions are allowed. Now follow it with a space, and then your command. Enter this line with the RETURN key. The computer will not execute the command, but will instead store it away to execute later. For example, try entering:

```
1 PRINT "NOT NOW, LATER!"
```

The computer does not print anything! It just sits there. Let's enter another deferred command.

```
2 PRINT "BUT NOW IS LATER"
```

This command also is not executed, but simply stored in memory.

We've just created a very simple program made up of two different PRINT commands. The program is stored in the computer's memory. If we want to run our program, we enter the immediate command RUN. Try it out. The computer will now execute the commands in the program and print out two lines of characters. You can ask the Atari to RUN this program as often as you wish—the program still remains in the memory.

If you wish to see the program, enter the command LIST. This causes the computer to list any program in its memory. Try it out. The Atari will print out the two lines you entered earlier.

HOW THE ATARI RUNS A PROGRAM

When the computer runs a program, it checks the numbers at the beginning of each line in the program. It then performs the commands in numerical order, going from the lowest line number to the highest line number. The numbers don't have to be consecutive, as they were in our example. For instance, you could have entered the two PRINT commands as lines 10 and 20 instead of 1 and 2. The program would still run in the same way. If you had entered the two lines above in reverse order by first entering line 2 and then line 1, the computer would reorder the lines by their numbers and execute line 1 before line 2.

There are some commands which alter the order in which the computer executes the program lines. GOTO, for example, is a command which is followed by a line number. When the computer executes this command, it will jump to the line number mentioned, start executing commands there, and then move on to the following lines. Let's try it out. Enter a third line in our program:

```
3 GOTO 1
```

Now RUN the program. Your screen will quickly fill up with text! We have programmed an endless loop. The Atari executes lines 1, 2, and 3. The command at line 3 tells it to go back to line 1, and so it does, starting all over again. Since the computer is very obedient (or incredibly simple, depending on how you look at it), it repeats the commands endlessly. Now is a good time to use the BREAK key, which makes the computer stop its loop. Programmers use GOTO and other similar commands so that small programs can accomplish a great deal of work.

Since we've gone to the work of writing this incredibly valuable program, we don't want it to be erased and lost forever when we turn off the computer. Let's save it.

SAVING A PROGRAM ON CASSETTE

If you have a Program Recorder and want to save the program on a cassette, here's what to do:

1. Put a cassette in the recorder. (Make sure it's rewound all the way to the beginning of the side.)
2. Enter the command CSAVE, which stands for cassette save. You will hear two buzzes from the computer. This is a signal to press two keys on the recorder.
3. Press the PLAY and RECORD keys on the recorder simultaneously. They should lock into place.
4. Hit RETURN on the computer. You should hear a high-pitched whine from your monitor speaker, and the cassette in the machine will start moving. After a few seconds, you'll hear some ugly sounding raspberries from your monitor. Never fear! This is the sound of your program being transferred to the cassette. When the computer is finished, the noise will stop, and it will come back to you with READY on the screen.
5. Press the STOP button on the recorder, and rewind the cassette to the beginning.

Your program is now stored on cassette.

SAVING A PROGRAM ON DISK

If we're going to store the progam on a disk drive, we'll need to think of a name for our program. DOS (the Disk Operating System) needs the name to store the program under, so we can ask for it by name later.

Naming the Program

DOS is very particular about the name we use. It has to follow these rules:

1. It can't be any longer than 8 characters.
2. We can only use the letters A-Z and the numerals 0 through 9 in the name.
3. The name must start with a letter. (Numerals can only be used after the first character of a name.)
4. We cannot use lower-case letters, inverse characters, or spaces in the name.

If you need more than eight characters in the name, you can add a three character *extender*. Type a period after the name and add one to three characters. The extender must follow rules 2 and 4 above. Some examples of correct names are:

- TESTPROG
- DIZZY
- GAME1
- NAMELONG.EST

The computer will not accept names like:

- ELIZABETH (more than 8 characters without an extender)
- TEST 1 (has a space in the name)
- 1TEST (starts with a number and not a letter)
- Gamepack (uses lower-case letters)
- HELP!! (uses exclamation points)

Let's name our program TEXT, since that's what it produces on the screen. Find an empty, formatted diskette. If you don't have one, or you're not sure if it's formatted, you'll have to jump ahead to Chapter 5 to find out how to format a blank disk. Take the Master Diskette out of the drive, and insert the formatted diskette. We are now ready to store our program on disk.

Saving the Program

We use the command SAVE to save our program. We follow it with D: to indicate that we will save it on disk, and follow that with our program name. This information following SAVE must be in quotation marks. This is how it should look:

```
SAVE "D:TEXT"
```

When you enter this command, you'll hear the disk drive start up and chatter for a short while. The beeping noises you hear coming from the monitor speaker are the sounds of your program being sent to the disk drive. After a second or two, the noise will stop and the computer will respond with READY. This means that your program is now saved on the disk.

ERASING THE MEMORY

Now that we have stored our program on either cassette or disk, let's enter LIST to see what's in the Atari's memory. Our program should still be there. When we save a program, it's duplicated on the program storage device and not erased from memory. Here is a command to wipe the Atari's memory clean: NEW. Enter NEW, and now enter LIST. The computer lists nothing! The Atari's program memory is now clean, and our program is gone. Fortunately, we saved it elsewhere.

LOADING A PROGRAM FROM CASSETTE

Now we need to get our program back into the Atari's memory. Here's how to load it from cassette:

1. Insert the cassette in the recorder (make sure it's rewound all the way).
2. Enter CLOAD (for cassette load), and you will hear one buzz from the computer. This signals you to press one key on the recorder.
3. Press the PLAY key.
4. Press RETURN on the computer. After a few seconds, you will hear raspberries from your monitor speaker. This is your program being loaded. When it is entirely loaded, the computer will respond with READY.
5. Hit STOP on the recorder.
6. Rewind the tape for the next time you need it.

Your program should now be loaded. Enter LIST to see if the program is there. It should be. If not, try again, and make sure the cassette is rewound.

LOADING A PROGRAM FROM DISK

To load a program from disk:

1. Insert the program disk in the disk drive.
2. Enter LOAD "D: followed by your program name and a close quote.

To reload our TEXT program, we enter:

```
LOAD "D:TEXT"
```

The disk drive will whir, the monitor will beep, and you should have your program in the Atari's memory in a few short seconds. When it is finished loading, the Atari will respond with READY

Your progam should now be loaded. Type RUN to see if the program is there and working. It should fill up the screen with text if it is. Remember to hit BREAK to stop the program.

If you're using the disk drive to load a program, you can shorten the above process by entering:

```
RUN "D:TEXT"
```

When you use the RUN command followed by the program name, the computer combines the LOAD and RUN commands by first loading the program, then immediately running it after it is loaded.

5. FILE STORAGE: CASSETTE AND DISK

While you work with your computer, you will begin to accumulate programs and data. These saved programs and data are known as *files*, and might be thought of in the same way you would think of files kept in a file drawer. Each file on disk or cassette might contain a program or a list of information, such as your address book or a recipe file.

As your collection of disks and cassettes grows, you'll probably have the experience of losing some of your files through faulty hardware or careless handling. Learning more about file storage can prevent this. In this chapter, we'll discuss the hows and whys of file storage: how to buy the proper cassettes and diskettes for your system, how to store your files safely, how to keep your hardware in top condition, and other useful facts. This chapter is divided into two parts, one for cassette storage using a program recorder, the other for disk storage using an Atari disk drive.

CASSETTES AND THE PROGRAM RECORDER

There are two Atari program recorders: the older Atari 410 Program Recorder, which is no longer made, and the Atari 1010 Program Recorder which is now being sold.

Other than the external appearance, these two machines are almost identical in performance and use, and use the same type of cassette.

What type of cassettes will the program recorder use? It will use any kind of cassette that a simple audio cassette recorder will use. Naturally, some cassettes work better than others, and some offer much more value for their cost.

Buying Cassettes

Our first order of business is buying cassettes. First of all, the program recorder is not set up to take advantage of the higher grade tapes used in audio recording, such as chromium dioxide or metal particle tape. Ferric oxide tape works just fine; it's also cheaper. The second item to consider is that the program recorder packs a lot of information on a small amount of tape. Short-length cassettes work best for storing files. The third major consideration is the length of the leader on the cassette. The leader is a short length of tape at the beginning and end of each cassette. It does not have any ferric oxide on it, and can't be recorded on. It's used to make the cassette tape stronger where it joins the hub inside. If the leader is longer than 13 inches (7 seconds worth), it will not work with the program recorder.

So what is the ideal cassette for use with the program recorder? Try a C15 or C30 ferric oxide tape with a leader shorter than 7 seconds. A C15 cassette gives you 7 1/2 minutes of recording time per side, and can store over 25,000 characters of data. Longer tapes work well, but you'll have to do a lot more rewinding and fast forwarding to get to files stored on your cassette. There are leaderless cassettes manufactured specifically for computer use, but these are usually more expensive than audio cassettes, and not necessarily better.

Multiple Program Storage on Cassette

When you save information on a cassette, it's usually convenient to store just one file on each side. This way, there's no problem finding the beginning of your file. You just rewind the cassette to the beginning of the side, then load the file. If you'd like to save some money by putting several files on each side, you must use the tape counter on the program recorder. The tape counter is a small meter that tells you how much of the cassette you've played.

When you first put the cassette in to save a file, make sure it is rewound all the way to the beginning of the side. Press the small button next to the counter. This will reset the counter to 000. Now save the file. When the Atari is finished, and the program recorder has stopped, advance the tape at least 10 counts past the currrent counter reading. Write the new counter reading down, and you're ready to save another file. This way you can save many files on one side of a cassette. Just be sure to leave at least 10 counts between the end of one file and the beginning of the next, and to write down the counter reading at the beginning of each file.

When you want to load a file from a cassette that has several files per side, first rewind the cassette all the way to the beginning of the side. Set the counter to 000, then fast forward the cassette to the counter reading where the desired file is stored. Follow normal loading procedures. Sometimes the counter will get off by a count or two, and the file will not load. Don't despair. Try starting the file load at counter readings one or two counts on each side of the original reading. If it still doesn't load, then it's time to despair! You may have lost your file for good.

Another hazard to keep in mind is that tape stretches. This throws the readings off, and can even make a file stored at the beginning of a cassette refuse to load. In this case, just advance the tape another counter reading or two and try again. Files stored at the beginning of the tape are more immune to loss than those stored in the middle of the tape.

One other important fact to note is that tape counters vary from recorder to recorder. Therefore, you'll probably have trouble finding a file stored in the middle of a cassette made on another machine.

Duplicating Files

As you can see, cassettes are not always the most reliable of storage media. It's important to make duplicate copies of important files by saving them twice. This way, if one of your files is lost because of a faulty cassette or an error in saving it, you always have a backup. Get into the habit of backing up every important file on two different cassettes.

Once you have two cassette copies, keep one rewound to the beginning of side 1, and the other rewound to the beginning of side 2. This way, you will not have to go through a lot of rewinding to get to a program on the opposite side of a cassette. Just use the cassette that's rewound to the side you want.

Write Protecting a Cassette

When you have important files that you absolutely do not want erased or recorded over, there is a way to *write protect* the cassette. Lay the cassette with the side you want protected facing up. Turn the cassette around so you can see the back. You'll see two small tabs. Break out the one on the right. The top side of the cassette is now write protected.

To write protect the other side, break out the other tab. You'll find that it's now physically impossible to record on the write protected sides. You won't be able to press the RECORD key down on the recorder when you put the cassette in. If you change your mind and want to erase or record over a write-protected cassette, just put a piece of tape over the write protected tab socket. Now you can record on the cassette.

Care of Your Cassettes

When you store your cassettes, be sure to keep them away from magnetic fields. Magnetism erases cassettes. Common sources of magnetic fields are your computer monitor and high heat. Leaving a cassette in a closed car on a hot sunny day may not only erase parts of your cassette, but may also melt the plastic casing.

In addition to physically protecting your cassettes, be sure to label them clearly so you know what files are on which cassette, and where. This is especially important for files stored in the middle of a cassette. They will be lost completely if you don't know where to set the tape to start loading! Good cataloging will save you a lot of time and trouble.

Recorder Maintenance

Like any audio cassette recorder, your Atari Program Recorder needs some routine maintenance to keep it in peak condition. This maintenance is fairly simple, and can be done in a few minutes.

Cleaning the Heads As you use your recorder, some of the ferric oxide on the cassette tape will rub off on the record and playback heads. Eventually this buildup will prevent recording and playback. You should clean the heads periodically. You'll need a cotton swab and some 95% denatured alcohol. Here's what to do:

1. Unplug the recorder.
2. Press the STOP EJECT key to open the cassette compartment.
3. Press the PLAY key to make the recording and playback heads come out.
4. Dip the swab in alcohol, then wipe the tape heads.
5. Wipe the pinch roller and rubber capstan wheel, rotating the capstan wheel with your fingers to make sure you get the whole wheel.
6. Clean out any cotton left over in the recorder.
7. Press STOP to retract the heads.

Demagnetizing the Heads Tape passing by the heads also imparts a small magnetic charge which can build up over time. This magnetism will also impair the record and playback quality of the recorder. To demagnetize the heads, you'll need a head demagnetizer, which you can buy at an audio or electronic store. Now:

1. Open the recorder and extend the heads as described above.
2. Plug in the demagnetizer and turn it on if it has a switch.

3. Pass the tip of the demagnetizer over each head a few times.
4. Slowly pull the demagnetizer away from the heads until you're a yard or two away.
5. Turn off the demagnetizer.

It is important to follow steps 4 and 5. If you turn off the demagnetizer close to the recorder heads, it will leave a magnetic charge.

Cleaning and demagnetizing the heads occasionally will keep your recorder in good shape and minimize file losses. There are a number of maintenance products on the market to make this even easier, but beware of cleaning cassettes; they are abrasive and will eventually wear out the heads.

DISKETTES AND THE ATARI DISK DRIVE

There are two types of Atari disk drives: the 810, which has been discontinued, and the 1050 disk drive which replaced the 810. The 810 is a single density drive, and the 1050 is a dual density drive, which means that the 1050 is capable of storing more data on a disk than the 810. Although the two drives have their differences, they both operate in much the same way, and both use the same size floppy disk.

As a rule, file storage on disks is much more convenient and efficient than cassette storage. There are still several things to watch and take care of when using the disk drive.

Buying Disks

In order to store any files using your disk drive, you'll first need to buy some disks. There are many different kinds of disks out there. Which ones work with Atari disk drives? In a nutshell, the Atari 810 uses a 5 1/4 inch, *single-sided, single-density, soft-sectored* floppy diskette. The 1050 uses a 5 1/4 inch, single-sided, *double-density,* soft-sectored floppy diskette. This is quite a mouthful! What does it mean?

First of all, Atari drives use floppy disks, and not hard disks which are made of steel. There are three sizes of floppy disks: the 8 inch floppy, the 5 1/4 inch floppy (called a mini-floppy), and the 3 1/2 inch floppy (called a micro-floppy). Atari drives use a 5 1/4 inch floppy.

"Soft-sectored" is a term that describes the way Atari drives locate information stored on disk. Some drives use a hard-sectored disk. There are holes punched in the disk that the disk drive can read to tell how far the disk has rotated. Atari drives don't need these holes. They set down magnetic signals on the disk that they can read later to determine disk position. This is soft-sectoring.

"Single-density" and "double-density" refer to the storage quality of the disk. A double-density disk is certified to pack twice as many bits of data in a small area as a single-density disk can. Double density disks are more expensive, and have a higher recording quality. The 810 disk drive will work with either single- or double-density disks, although there's no need to use double-density, since it can't take advantage of its quality. The 1050 disk drive must use double-density disks to be able to pack more information on one disk. Since most disk manufacturers now only manufacture double-density quality disks, you probably won't have to worry about density.

A last consideration when buying disks is choosing between single-sided or double-sided disks. Atari drives will use either kind. The difference between the two is that single-sided diskettes only record on one side, while double sided disks can be recorded on both sides, doubling the storage capacity. Double-sided disks are made for disk drives which can read both sides of the disk without flipping the disk over. These drives are more expensive than single-sided drives. Later in the section, we'll talk about converting single-sided diskettes to double-sided diskettes, which you can flip over manually to get extra storage on each diskette.

When you finally sally forth to the market to buy your disks, what should you look for in quality? Many disks have guarantees that range from a few years to a lifetime. Many also have reinforced hubs, which make the disk sturdier and give it a longer lifetime. Some disks are packaged in plastic library cases which you can use for storage later on, some come in cardboard boxes. Some include labels, others don't. In general, you should try to buy the sturdiest disks possible for your money, since a worn out disk means lost files. Unless you have a special disk storage holder, you might want to pay a little extra money for plastic cases, which are sturdy, convenient to use, and will protect your disks from minor catastrophes.

Initializing Disks

Now that you have your disks, we must *initialize* them (also called *formatting*). As explained before, Atari drives use a soft sector system to find locations on the disk. A brand new blank disk will only confuse the drive hopelessly. Before the disk can be used, the drive must put down magnetic signposts so it can find its way around later on. This process is called formatting. Once this is done, the drive completes initialization by creating an index area to hold the names of future files.

Using the DOS Menu

You might remember seeing the DOS menu when we learned how to power up in Chapter 2. You'll get the DOS menu on the screen anytime you power up with the Master Diskette containing DOS in the drive and no cartridge in the 400, 800, or 1200XL computers. To see the DOS menu when you've got a BASIC cartridge in or when you're powering up with a 600XL or 800XL computer, wait for the READY prompt on the screen, then enter the command DOS. After a few seconds of loading, the menu will appear. If it doesn't, check to make sure you've got the Master Diskette inserted in the drive. You should be aware that going to the DOS menu will usually erase whatever BASIC program you have in memory! Be sure to save anything you want to keep before you go to the DOS menu.

There are two main versions of DOS which come with Atari disk drives: DOS II and DOS 3. DOS II was shipped with drives until the beginning of 1984, when DOS 3, which is an improved version of DOS, replaced it. You can tell which version of DOS you have by looking at the title at the top of your menu. In this Handy Guide, we'll explain how to work with DOS 3. If you don't have DOS 3, you can get it on a diskette with an accompanying manual through your Atari dealer.

The DOS menu works much like a restaurant menu. You'll notice a list of options with their first letters highlighted. You can choose the option you want to entering the appropriate letter. Each one of these options performs some kind of task that copies files, moves them from disk to disk, renames them, erases them, and so on. We haven't the time to go over all of the DOS options here, so I suggest you read the manual accompanying your Master Diskette.

Initialize Option

Let's format those new disks we bought. With the Master Diskette in your drive, enter I (for Initialize). The computer will then load the initialize utility, and then ask you which drive you want to use for initialization. Enter 1 (for disk drive #1, even if you only have one disk drive).

Next the computer will ask you if you want double or single density formatting. If you have an 810 drive, enter 1 for single density, which is the only density the 810 uses. If you have a 1050 drive, you get your choice. Entering 2 will format your disk so that it will hold about half again as much data as single density will.

The next two questions the computer asks are to determine if you want a copy of part of DOS (called "FMS.SYS") put on your disk. Answer N for No on both questions. The computer now displays what your choices were. If you want to change something, hit SHIFT and CLEAR together, and you can reenter your answers.

When you're ready to go on, take the Master Diskette out of the drive, and put the blank disk in. Press RETURN, and the formatting process begins. You'll hear the drive clicking and whirring as it formats the disk. When it's done, the drive will stop, and the screen will say "Initialization completed." If you're done formatting disks, press the ESC key to get back to the main menu. If you want to format more disks, press RETURN. The summary page reappears. Take out the formatted disk and insert another blank disk. Press RETURN, and you're formatting again. Do this for all your new diskettes, so you won't be frustrated trying to use a blank disk later on.

One very important fact about formatting: *It erases everything already on the disk!* If you have a disk with important files on it, formatting will erase them all. The format option can be a handy disk-erasing function, but use it with care.

File Index Option

Someday you'll come across a disk in your collection, and you'll have no idea what's on it. Then it's time to use option F, the file index. Put a disk with some files stored on it (your Master Diskette will do) in the drive. Now type F (for File Index) followed by four RETURNs. A list of all the files stored on the disk will be printed on the screen.

Notice that each file is followed with a number. This number tells us how many *blocks* it takes to store the file. A block is an area of the disk that stores one kilobyte of information. The 810 disk drive can use 87 blocks for storage, the 1050 can use either 87 or 127 blocks, depending on how the disk is formatted. At the bottom of the listed files, you should see a line which tells you how many free blocks remain. If you pay attention to the block information, you can tell how much room is left on your disk for more files. You can also see which files are longer than others by noting the number of blocks it takes to store them.

To Cartridge Option

The last DOS menu option we'll learn to use is T, To Cartridge. Pressing T will take us back to BASIC or any cartridge we have plugged into the cartridge slot. The DOS menu will disappear, and we can start working with the program on the cartridge. (You can't plug a cartridge in or change cartridges while you're using DOS, though. It will cause your computer to freeze up, and you'll have to turn it off and start all over.)

Write Protecting Disks

We found out that when you format a disk, everything on it is erased. It's also possible to lose files by using the same file name twice to save to different programs. If we have something very important on a disk and want to be absolutely safe, we can *write protect* the disk so that it will be impossible to format or write anything new on it. When you insert a disk into the drive, you'll notice a notch in the left-hand side of the sleeve of the diskette. This is the write protect notch for the side of the diskette you are loading.

When the disk is in the drive, a beam of light shines where the notch is, and if it passes through, then the drive is allowed to write on the disk. If the beam of light does not pass through the disk, no writing or formatting is allowed. To write protect the disk, take a write protect tab, which should be furnished with your disk, and wrap it around the notch. If you don't have tabs, you can use a piece of black tape or anything that will block the light passing through the notch. Your disk is now safe. If you want to write to your disk again, simply remove the tab from the disk.

Converting Single-sided Disks to Double

When disks are manufactured, each side is checked for recording accuracy. If one side does not measure up, then only the good side is used, and it becomes a single-sided disk. In most cases, the bad side is still quite usable by an Atari disk drive. The only reason that the back side can't be used is that there is no write protect notch for it.

If you take a paper hole punch and punch a notch on the opposite side of the sleeve from the original notch, you can then use the back side of the disk. Be sure the second notch is located at exactly the same position on its side of the sleeve as the original notch is on its side. Otherwise, the notch light won't find it, and won't allow you to use the back side.

A couple of important things to note: Any warranty on your disk will certainly be voided. Also, the back side is not as dependable as the certified front side. You will know if the back side works if you can format it. If you can't format it, then it's a bad side and can't be used.

Storing and Protecting Diskettes

Like cassettes, disks are prone to damage from outside forces. Keep them away from magnetic sources such as your monitor, or you risk file erasure. Extreme heat can also erase files, so avoid leaving disks in a hot car. Moisture can ruin a disk, and touching the exposed area of the disk through the head reading holes can ruin files with fingerprints. Never bend the disk; it will keep it from spinning freely. Always keep the disk stored in its jacket, and try to keep it in a case or file, away from dust and dirt.

Maintaining the Disk Drive

The disk drive has a recording head like a tape recorder, which needs to be maintained in a similar manner. Dirt, dust, and ferric oxide from the disk can build up on the head and diminish its recording capabilities. It can also build up a magnetic charge over time. The head needs to be periodically cleaned and demagnetized.

Unlike a tape recorder, the head is located deep inside the machine, where it can be hard to get at. Some people prefer to take their disk drive in to a service center to have it cleaned and demagnetized. Others do it themselves, either by taking the drive apart and cleaning the head by hand, or by using a cleaning disk.

6. PERIPHERALS

As you get to know the capabilities of your Atari and become more proficient in using it, you'll also become more aware of the things you wish it could do that it can't. Never fear! It's easy to add peripherals to your computer system that will build it into a truly powerful tool. There is an amazing variety of add-ons built by Atari and other companies, and we'll take a look at many of them in this chapter.

Before you go out to spend money indiscriminately on hardware for your Atari, take some time to consider your purchases. Answering the four questions below satisfactorily will help you avoid buying a peripheral that just collects dust later.

Does the peripheral do what you want it to do? The CollosoWriter 8000 printer may print 8000 characters per second, but if it's all in Japanese, it may not fit your needs. Be very specific about what you want a peripheral to do before you start shopping.

Is the peripheral compatible with your computer system? Make sure first of all that it will run with an Atari computer. Then make sure you have the necessary memory needed to support the peripheral. Some peripherals also need extra connecting cables and equipment before you can attach them. Be sure they are available.

Can you buy or write software to run the peripheral? Unless your Atari has a program telling it how to give orders to this strange piece of hardware, it won't be able to do a thing. Some hardware manufacturers sell software with their peripheral, others let you write your own (if you have enough information) or let you find it on the market. Just make sure you can supply it somehow, or your peripheral will just sit there and make you feel foolish.

Is there a clear owner's manual or a knowledgeable person around to make sure you know how to operate the peripheral? Never forget that most computer equipment is more than a little complex; it needs good clear instructions to be properly operated. If you have a knowlegeable friend or salesperson around, fine. If not, make sure you take a look at the manual before you buy.

Once you've settled on a good peripheral, you have two major options for buying it—mail order discount stores and retail computer stores. The advantage of the mail order discount business is obvious: very low prices. Unfortunately, at these low prices they can't really afford to give you much service or advice. Mail order works best when you know you won't have problems operating what you buy.

If you aren't good at wading through manuals, or need some good advice, you should consider buying at a retail store. Just make sure that the employees there really know the equipment they sell, or you'll be paying more for nothing.

Now let's take a look at some of the products out there. What will they do? We'll look at the most popular peripherals, and also examine some of the more unusual hardware available. Occasionally we'll discuss a specific peripheral model when it provides a good example of a certain type of peripheral. Keep in mind that it's just an example, and the brand we mention may not be the best for your purposes. As always, you must shop around.

Since the microcomputer industry is changing constantly, be on the lookout for new products coming on the market and old ones being phased out. Prices are always changing.

PRINTERS

Adding a printer to your computer gives it the ability to create "hard copy"—print which will not disappear the moment you switch off your computer. A good printer can print out listings of your programs, letters to friends or business associates, mailing labels, manuscripts, and many other documents. It's one of the most useful peripherals available. Since there is a huge selection of printers compatible with the Atari computer, at increasingly competitive prices, it's very important to know what you want your printer to be able to do before you buy it.

One of the first things to consider is character quality. How does the printer form the characters that it prints on paper? Most computer printers are *dot matrix* printers. Dot matrix characters are formed by a small comb of pins which sweeps across the paper for each line of print. The pins hammer against an inked ribbon in the correct combination to create whatever kind of character is desired. The more pins there are, the more complex and well-formed the characters can be. Although dot matrix print does not look as nice as typewritten text, it's much faster, and usually offers a choice of different character styles called *fonts,* such as pica, elite, boldface, and elongated. Quality of print changes quite a bit from printer to printer, and usually varies according to price.

A cheaper form of dot matrix printer is called the *thermal* printer. The thermal printer uses specially coated paper, and prints by using hot pins that burn the characters into the chemical coating instead of hammering them on with a ribbon. The disadvantage of the thermal printer is that it must use special paper, and the print quality is not usually good. However, it is much quieter than any other kind of printer.

For very high quality print, most people use a *letter quality printer*. The letter quality printer creates letters the same way that a typewriter does—it hammers the characters on the paper using a ribbon and a set of fully formed metal, plastic, or rubber characters. While it's possible to actually hook up an electric typewriter to the Atari (with considerable difficulty unless the typewriter is especially designed for a computer interface), it's usually preferable to use a *daisy wheel printer*. The daisy wheel printer has a small rotating wheel (the daisy wheel) with many flexible hubs. Each of the hubs ends with a metal character which strikes ribbon and paper to print a character. A daisy wheel printer prints much faster than a typewriter, but with equivalent print quality. You can change fonts by physically changing the daisy wheel. A letter quality printer's high print quality is offset by its slow speed and high noise output. Many of them are also quite expensive, but some have recently been priced under $400 (including the Atari 1027 printer.)

Other things to consider when buying a printer:

Is it *bidirectional* (able to print both coming and going, which gives it more speed)?

How many columns across will it print? To fill an average 8 1/2 × 11 inch of paper, it usually takes 80 columns, sometimes up to 132 columns if the printing is small enough. Extra columns come in handy when trying to fit a lot of information on one page. 40-column printers are usually used to print on a small roll of adding machine paper, and are good for printing out progams, but not so good for letters.

Does it have friction feed, tractor feed, or both? Tractor feed uses toothed gears or belts to feed fanfold paper (special computer printer paper) through the printer without you worrying about putting each page in separately. Friction feed lets you put in individual sheets of paper, such as letterhead stationery.

How big is its *buffer?* Your Atari feeds text to the printer very quickly. The printer uses it very slowly, which forces your computer to wait. A buffer is memory in the printer which stores the text from the computer and feeds it to the print head. The larger the buffer is, the sooner your computer can finish feeding text to the printer so you can use it again.

Is it capable of graphics? In other words, if it's a dot matrix printer, can you control each individual dot printed to create detailed pictures instead of characters?

Atari makes several printers which connect directly to Atari computers without special equipment: they are the 1025 printer, which is a dot matrix printer, and the 1027, which is an inexpensive letter quality printer. Other popular printers are the Epson MX-80 and the NEC PC8023A

MODEMS

A modem will connect your computer to the phone lines and other computers, so you can send and receive data quickly over long distances. With a modem, you can access large banks of information stored in computer networks, such as airline schedules, late breaking news reports, and much more.

As with printers, there is a variety of modems available to use with the Atari. One of the first considerations a modem buyer must make is that of speed. How quickly can the modem send and receive data over the phone lines? Data transfer speed is measured in bits per second (bps). Most modems used with microcomputers are capable of 300 bps, which would let you send one screenful of text over the phone lines in about a minute and a half.

1200 bps modems are becoming more common now, and will quadruple your data transfer speed. Many modem makers refer to "baud rate" in describing their equipment. The baud rate measures the frequency of the signal that carries the data. Sometimes the baud rate is equal to the bps capability of a modem, but sometimes it is not. For instance, most 1200 bps modems use a 600 baud signal for transmitting data. Always look at the bps measurement to determine data transmission speed.

Modems can transmit data in *full duplex* or *half duplex*. Full duplex transmission allows the modem to send and receive data at the same time, similar to a telephone conversation where you can listen and speak simultaneously. Half duplex transmission forces two computers to take turns sending and receiving data, much like a conversation over a two way radio. Full duplex is most common in microcomputer modems.

Another important consideration is whether the modem is *direct connect* or *acoustic*. An acoustic modem requires you to place the handset of a telephone into a cradle lined with foam rubber, where the direct connect modem does away with the need for a telephone, plugging directly into a telephone jack and sending electric signals over the phone wires. Direct connect modems are much more reliable than acoustic modems.

Many modems are "intelligent." This means they contain their own microprocessor and software which allow the modem to perform many tasks by itself with only a prompt from your Atari. Let's take a look at the intelligent features of the Hayes Smartmodem 1200.

The Smartmodem 1200 can transmit data at both 300 and 1200 bps, and other rates below 300 bps. This direct-connect modem can send data at either full or half duplex. The microprocessor inside allows it to automatically set itself for the data transmission rate you choose to use with your computer. It will also dial any number you wish, using either touch tone or rotary dial signals. It can answer the phone, and will also hang up when the computer on the other end of the line hangs up. These intelligent features make life much easier for modem users, and allow you to set yourself up as a "bulletin board." This particular modem sells for under $600.

Keep in mind that a modem requires a modem cable and the 850 Interface Module to connect it with the Atari. You'll also need some software to run it. Prices for modems range from the $600 already mentioned to below $100 for much simpler models.

ATARI 850 INTERFACE MODULE

Most printers and modems can't be connected directly to the Atari computer. Many printers, for instance, use a parallel interface port, but there are no parallel ports on the Atari! You need an Atari 850 Interface Module. This interface module plugs into the peripheral port of the Atari, and has a parallel interface port as well as four serial interface ports. The parallel port is usually used to connect printers, and the serial ports can be used to connect many different peripherals, including modems. The 850 has its own microprocessor and machine language software which keeps track of all the peripherals attached to it. The Atari 850 is available for under $200, and allows you to add all sorts of exotic hardware to your computer.

Lately, some new alternatives have been showing up for printer connections. Some disk drives built for the Atari computer by outside manufacturers include a parallel printer port, which saves you the cost of buying an 850 interface to connect a printer.

IMPROVING YOUR CURRENT SYSTEM

Printers and modems are additions to your Atari system. Many products are made to improve and expand the capabilities of equipment you may already own, such as memory expansion or keyboard replacement. Let's take a look.

Expanding Your Memory

If you bought an Atari 800 before 1983 without the full 48K of RAM included, Atari makes memory cartridges which plug into the three memory slots of the 800. These RAM cartridges come in memory amounts of 8K and 16K. Atari 1200s come with a full 64K of memory and are not usually expanded. Atari 400's are sold with 16K of memory, and are theoretically not meant to be expanded since they have only one memory slot which is hidden in the depths of the computer. There are ways around this!

Independent hardware producers have come out with memory boards which are fully compatible with Atari computers. They come in amounts of 16K, 32K, 48K, and 64K. 16K and 32K memory boards are used to expand the 800 computer to its full memory capacity of 48K. Using a 32K board with a 16K board brings your computer up to 48K without using the third memory slot. This extra slot can come in handy later, as we'll see.

48K boards are used mainly for expanding the 400 computer to 48K. The 400 is not designed for easy memory expansion, so you must take the computer apart to get into the memory slot. Since there's only one slot, the 16K RAM board which occupies it must be taken out and the 48K board inserted in its place. Most owners have a computer service shop change their memory if they feel uneasy about taking their computer apart. Remember that the board which comes out of your 400 is still perfectly good, and can be used in the memory slots of the Atari 800.

Mosaic Electronics manufactures a 64K RAM board for the 400 and 800. The design of the 400 and 800 computers will not allow the use of more than 52K of RAM, so the extra 12K is available only by switching back and forth between four different 4K blocks of memory. The benefits of a 64K RAM board may not be useful for the beginning computer user, but intermediate and advanced users can make very good use of it.

Several different companies make memory boards. Non-Atari boards are usually lower in price than the equivalent Atari boards. Qualities which distinguish one board from another are the length of their guarantee and the quality of their components. Some boards are built with gold-plated connectors which discourage corrosion. Corroded memory connectors will lock up your computer.

To expand the memory of the 600XL computer, you can add an Atari Memory Module, which plugs into the expansion bus on the back of the console. This will expand your memory capacity to 64K of RAM. The memory boards for the 400 and 800 won't work with the 600XL.

The Computer Monitor

Most people who buy a home computer use their television set as a monitor, since it saves them the cost of buying a new peripheral. A TV set is not often the ideal monitor, however. The picture quality is not as clear as it might be, and text can be difficult to read. If someone is using a hair blower or a vacuum cleaner, or if your printer is turned on, the TV set will usually pick up static and interference. A computer monitor can solve these problems.

Computer monitors are specially designed for use with computers, and present a much clearer picture than a TV set. They connect directly to the computer without the use of a junction box, and use a much wider bandwidth to send the picture over which results in a much clearer picture. They come in two basic types: the color monitor and the monochromatic monitor.

A color monitor looks and works like a color television set without a channel selector. One very popular model for use with the Atari is the Amdek Color-I monitor (see Figure 1.1). It has knobs to control the speaker volume, the color, tint, brightness, and contrast of the picture, and the vertical hold. Most color monitors have a 13-inch screen. The Amdek has a speaker, but not all monitors do. If you use a monitor with no speaker, you can easily hook up a separate speaker or feed the audio signal to our stereo system.

Monochromatic monitors usually display just green or amber against a black background. The chief advantage of a monochromatic monitor is that it can display text and fine lines with much more clarity than a color monitor. A monochromatic monitor is much less apt to create eyestrain than a color monitor. For these reasons, they are usually used for word processing purposes.

When you buy a monitor, be sure that it will accept a composite video signal, which is the type that the Atari computer sends out. RGB type monitors will not work with the Atari. Be sure that you get the special connecting cable necessary to hook your monitor up to your computer. Remember also that you can't use a monitor with an Atari 400 or 600XL, since they have no monitor jack.

Disk Drives

Disk drives are fast and efficient. Floppy disks are the most common medium for commercial software, and many tasks, such as word processing and data base management, are virtually impossible without a disk drive. If you have only cassette program storage, a disk drive should be your first upgrade. If you have one disk drive, a second drive can make your system much more flexible. If you're a glutton for mass program storage, you can connect up to four disk drives to an Atari, although two seems to be the optimum number.

The Atari 810 and 1050 disk drives are the standard drives in use with Atari computers, but other companies now make disk drives for the Atari computer. Some of these disk drives offer substantial improvements over the Atari drives.

To understand what makes one drive better than another, we should examine the features they offer. One of the most important is storage capacity. The Atari 810 drive, which is a single density drive, can store 88 kilobytes of data on a disk. The Atari 1050, a dual density drive, can store 130K of data, and some double density drives on the market for the Atari can store 176K of data.

If the terms double density and dual density sound confusing to you, you're not alone. To clarify: when a disk drive formats a disk, it lays storage space out in *sectors* (there are 8 sectors to a block on Atari drives). A single density drive stores 128 bytes of data in each sector, while a double density drive stores 256 bytes in a sector. When Atari came out with improved storage capacity in the 1050 drive, they did it by increasing the number of sectors on a disk from 720 to 1040. Each sector still holds 128 bytes of data, so technically, the 1050 is a single density disk drive. In order to show the improved storage capacity over the 810 drive, Atari concocted the term "dual density."

Most of the disk drives made by other manufacturers for the Atari are either single density drives that are lower priced, or true double density drives. If they are double density, they need a different version of DOS to make it work with an Atari computer, so most of these drives come with a special DOS. Most double density drives will automatically shift to single density for single density formatted disks.

Another important drive feature is its data transfer speed. Several companies, such as Trak and Indus, offer drives that will double or quadruple the transfer speed, which means you spend less time waiting for programs and data to store and load.

Many disk drives have added features that increase the value of the drive. Many have built in parallel printer ports, so you won't have to buy an 850 interface monitor to connect a printer. Some have a *printer buffer* built in, which will store information being sent to your printer, freeing your computer up for other jobs. Extra controls and indicator lights on the drive's front panel, can give you more information and control over the drive's operation.

Some of the most popular second party disk drives are the Indus GT, a double density drive with increased data transfer speed, the Trak ATD2, which feature double density with a printer buffer and parallel port, and Percom, which makes both double and single density drives with a reputation for durability. The Astra 1620 offers a very good value with two double density drives in one casing priced under $600.

The 80-Column Board

When you use the Atari computer to arrange text for printout on a printer, you'll run across a problem. You can only display 40 characters across the width of the monitor, while a good printer will usually print 80 columns across an 8½ by 11 inch paper. Plugging an 80-column board into your Atari will let it display 80 characters across the monitor.

Full-View 80 is an 80-column board manufactured by Bit 3 Computer Corporation. It plugs into the third memory slot of the Atari 800, where it is connected to the monitor by a very thin flat cable coming out from under the computer's cover. It works with the Atari BASIC cartridge, and will work with some word processing software on the market. Since the characters are reduced in size to fit in 80 columns, the only kind of monitor which will display the text from this board clearly enough is a monochromatic monitor. At this writing, Atari XL computers can't use the Full-View 80 board.

Full Stroke Keyboard for the Atari 400

If you do quite a bit of work with the keyboard of the Atari 400, you surely realize its limitations by now. It is cramped and difficult to feel correctly for a touch typist. If you're desperate enough, you can get a new keyboard without throwing away your 400 and buying a 600XL or 800XL.

Several companies make a full stroke keyboard kit which will replace the membrane keyboard of the 400. You must disconnect and unplug the membrane keyboard, then plug in and connect the full stroke keyboard. This fairly simple installation and can be done at home. These replacements keyboards generally sell for under $80.

Game Controllers

For all their serious applications, Atari computers are great game machines. The graphics and sounds are superb, and the joystick ports make connecting and disconnecting game controllers very simple. The Atari computer uses the same controllers as the Atari 2600 and 5200 video game machines, so Atari joysticks and paddle controllers are inexpensive and easy to use. However, video game connoisseurs might wish to buy special controllers to make their games play more like the arcade games. There are dozens of high-quality joysticks, paddles, and trackballs made by independent manufacturers.

A new controller that's become very popular is the *touch pad,* a square plastic pad corresponds to your monitor screen. You can touch the tablet with your finger or a stylus, and use it to draw on the screen or move characters around, depending on the software you have running. There are three popular touchpads available for the Atari: the Atari Touch Tablet, the Koalapad, and the Chalkboard.

ADDITIONAL PERIPHERALS

There is, in addition to the peripherals we have mentioned, a wide variety of miscellaneous peripherals which are useful or entertaining to use. Since the Atari computer is such an excellent video graphics machine, many of them augment those graphics abilities. Some of them make computer use a little more convenient.

Light Pen

A light pen looks much like its name: it is a slender metal tube attached to a joystick port. When you press a light pen to the screen, the computer can tell its location. When used with the appropriate software, it can draw pictures directly on the screen, select options from a screen-printed menu, erase, and perform many other functions. Atari makes an excellent light pen, and there are also several available from outside manufacturers.

Plotters

A plotter is somewhat like a digitizer in reverse: a picture on your monitor screen can be drawn by the plotter onto a sheet of paper. Plotters usually hold a sheet of paper on a paper bed and draw figures with fine felt tip pens. A plotter can usually use two or three different color pens, and the more expensive models can use up to six or seven pens. Aside from the colors available, the chief advantage of a plotter over a dot matrix printer capable of graphics is that the plotter draws very smooth lines and circles without that "computer look" that dot matrix leaves. Most plotters are also capable of printing out text for labelling pictures plotted. Atari makes the 1020 Color Printer, which is actually a small plotter, capable of excellent color graphics and text printing.

7. SOFTWARE: RUNNING YOUR COMPUTER

Without software you can do nothing to your computer system but turn it on and off. You need programs to run your computer to tell it what to do. If you can program, you can write your own software. However, many computer owners are not programmers, or don't have the time to spend writing programs. Even expert programmers don't have the time to create software for everything they'd like their computer to do.

Fortunately, the Atari computer system is very popular, and the large number of Atari owners creates a good market for Atari compatible software. The amount of software available is overwhelming. A glance through a computer magazine will reveal more software than most people would care to consider. There is software to keep your finances up to date, to teach the kids math, to play chess with you, to run your printer, to draw pictures on your monitor, and on and on. New software is being written all the time.

To make some sort of sense out of this rampant software, let's split it into four categories:

- Applications software
- Utility software
- Computer languages
- Games

Briefly, applications software is software written to perform a specific task for you, such as word processing, data base management, bookkeeping, education. Utility software is designed to make operating your computer easier. There are utilities to fix damaged disk files, to renumber BASIC programs, and to design graphic monitor displays. Computer languages offer you different methods of programming, and games are just that: entertainment

When you shop for software, as with hardware, it's very important to make sure it will work for you. Consider the following questions when buying.

Is the program compatible with your system? Make sure it's written for an Atari computer, and that you have enough memory to run it. Make sure it comes on a medium you can load in your system (i.e. cartridge, cassette, or disk). Make sure you have the necessary peripherals to make it work. For instance, a telecommunications program requires a modem.

Is the program easy to use? Difficult or "unfriendly" programs are sometimes self-defeating. For instance, a bookkeeping program which is very confusing will not save you any time over using pencil and paper.

Is the program versatile? A good program should give you many options and should be flexible enough to be used for your particular needs. In a game program, this might mean varying difficulty levels to keep the challenge up. In a data base program, it might mean being able to tailor your record format so you can enter the information most important to you. It's important to realize that versatility and ease of use often conflict with each other. You need to decide which is most important to you.

Will you get repeated good use of the program? This is especially important in game software where boredom can set in long before you've gotten the value of your purchase price from it.

Does the software company offer a good backup and replacement policy? Unfortunately, disks and cassettes do wear out, and if they do, the software you paid for is gone. Some companies give you "unprotected" software which means you can copy it yourself to create a backup for use in case of disaster. Most companies "protect" their software, making it impossible for you to duplicate. They do this to foil "pirating" (duplicating copyrighted software to give away or sell). Most companies who protect their software will replace failed disks or cassettes for a low price ($5.00 or less), and some will give you a second copy for use as a backup.

APPLICATIONS

Application software for the Atari falls into several general categories which are covered briefly below.

Word Processing

Word processing is one of the most useful applications of a home computer, and can save you a lot of time and effort if you do any kind of writing or typing. Many people who initially disdain computers are eventually won over by the convenience of word processing. It lets you write all of your text on the monitor screen and store it in RAM before having it printed out on paper. Since the text is stored on a very volatile medium, it's very easy to correct and edit. A push of a button will print out your text on a printer, and you can then store your text on disk for later re-use.

There is tremendous variety in word processing programs, and many users become ardent advocates of one program or another. Some of the features available in good word processing programs are discussed below.

Text insertion is the ability to insert new words or characters in the middle of previously created text. The computer will take care of the text following the insertion by moving it down as new text is entered

Text deletion allows you to take out single characters, and small or large blocks of text. Once again, the computer will shunt into place the text following the deletion so there is no gap in your text. Since mistaken deletion of large blocks of text can be disastrous, some programs have a failsafe feature which stores what you have deleted in a *buffer,* which is a separate area in RAM. By giving the appropriate command, you can reinsert the lost text in the position you wish.

Text movement is the ability to move a block of text from one area of your manuscript to another. This is a combination of text deletion and insertion, which allows you to jump one paragraph over another one, or interchange sentences for a more convenient order.

Global search and replace is a powerful editing feature which will search through the text you have already entered for any word or combination of words you would like to search for, and replace them with any other word or words of your choice. If you want to reuse a letter you wrote to Mr. Jones to send to Ms. Smith, you can have the computer change every occurrence of Mr. Jones to Ms. Smith.

Print formatting is quite different from the previously discussed word processing features, which let you order and correct your text as you wish, but have nothing to do with actually printing it out on paper. Print formatting does let you choose how your text will look on the printed page.

There are many aspects to print formatting. Font selection lets you use the different fonts that might be available on your printer so that you can italicize or use boldface for emphasis and use expanded characters for titles. Right justification evens the right margin of your text, and two-column printing will let you print in two columns on a sheet of paper, both of them right-justified. Text centering will center selected text in a page without you having to calculate how far to indent it.

Many word processing programs will automatically number pages of a manuscript, and print headers and footers (a common expression on the top or bottom of each page). Very fancy programs may even do footnotes.

Print previewing allows you to see how the page will be laid out before it's printed. this is quite a trick on the Atari, since it's limited to 40 columns and 24 lines. Most print previews will let you look at a section of a page at a time to see the margins, indentations, header, and footers. If you can find a program that works with an 80-column board, then print previewing is simplified, but still not entirely complete.

The most popular word processor for Atari is probably *AtariWriter,* from Atari. It's simple to use, comes on cartridge, can store files on cassette, and will work with many different printers. Other popular word processing programs are *Letter Wizard,* from DataSoft, and *Letter Perfect,* from LJK. Look for new word processors coming out on the market. Before you buy, try them out for ease of use, and make sure that they'll work with the type of printer you own.

Data Base Programs

Having a data base program lets you use your computer like a card catalog. The program will set up a file to store your records in. For instance, you might wish to keep a list of all your books in the computer memory. First, the data base program creates a *file*, perhaps called BOOKS, to store your information in. Then you would decide what information was important to know about books. The information about each book would be called a *record*, and each record would contain information in specific parts called *fields*. Each record in your Books file might have three fields: one for the title, one for the author, and one for the subject of the book. Once you have entered all of your books in the Books file, you will have one record for each book. You have just created a data base for your books. The data base program will store the records on disk and keep track of their location.

The real power of a data base program comes in handling the data base once it is entered. It will automatically put the records in alphabetical or numeric order using any field you wish. For instance, you might have it arrange all of your book records in alphabetical order by author. It will search through the data base to find any record using any field. You might have it show you each book record for book titles between B and F. The program is very powerful when you can search records using several fields at once. This lets you look for all books about octopi written by Ed Cephalopod.

The data base program should be able to generate lists and reports using a connected printer. This will let you print out your entire data base in any order you want, or just selected portions of it. It will also let you choose just which fields of the records you want printed, and in what order. Some data base programs will total up numerical fields at the end of a printout, which comes in very handy when storing income tax or other financial records.

Other data base programs, such as LJK's *Data Perfect*, will allow you to automatically merge your records with a word processor document, allowing you to create personalized letters from a mailing list and a stock letter.

In addition to *Data Perfect*, other popular data base programs for the Atari are *SynFile +*, a powerful and easy to use program from Synapse Software, and *The Home Filing Manager*, from Atari.

Financial Programs

There are several programs on the market to help you keep financial records. They range from specific home finances, such as keeping track of a paper route, to business applications such as general ledger records. While your business needs might require some very specific program, there are many general purpose business programs that are useful for a wide variety of users.

The Bookkeeper, by Atari, uses a disk drive and a printer to keep general ledger records using double-entry bookkeeping. It handles accounts receivable, accounts payable, checks written, cash received, invoices written, and prints out reports for all of these categories. Continental Software has *The Home Accountant*, which handles budgeting by keeping track of five separate checkbooks in 60 different budget categories. It will plot bar graphs of the information, and print out reports. *SynStock*, by Synapse Software, helps you analyze a stock portfolio by creating color charts and identifying trends.

Spreadsheets

A spreadsheet program is the computer equivalent of a large sheet of paper, a pencil, and a powerful calculator. It's extremely useful for complex calculations, business projections, and general figuring.

A spreadsheet allows you to do your calculations on a large electronic worksheet. Your monitor acts as a window on the worksheet, which is much larger than the monitor. The worksheet has many columns and rows, and you can enter figures, labels, or formulas at each location (known as a *cell*). The true power of a spreadsheet is the ability to define a cell as the result of calculations using other cells; when you change the value of any one cell on the spreadsheet, all other cells dependent on that position will change their value automatically. This extremely powerful feature allows you to use the spreadsheet for projections and "what if . . ." calculations. For instance, you might enter a series of products for sale with the individual prices, projected sales for the upcoming year, and sales totals. When you raise or lower the price of a single product, the projected sales totals will all be changed automatically.

VisiCalc, the original spreadsheet, is available for the Atari. So is *SynCalc*, from Synapse Software, which has added features for convenience.

Education

Education programs turn your computer into a teaching tool with great potential. Since the computer can react to the user's learning pace, it can present material at the proper rate for each individual. With the right software, you can learn skills and facts not always available by reading. There are many different programs available. For convenience, we'll categorize them as drill, simulations, or study courses.

Drill programs are usually used to teach children a fundamental concept using repetitive exercises for them to practice with. This need not be as dreary as it sounds. Many educational programs are written to make the learning fun, and are often some type of game, with rewards for correct answers and very nice graphic displays. Some of the topics covered are multiplication and division, spelling, geography, shape recognition, typing and speed reading for advanced readers. There are drill programs for all ages, from toddler to adult, and they are a good way to teach fundamentals as well as to make the user more comfortable with computers.

Simulations can teach complex subjects by presenting a situation on a screen that the user must react to in a knowledgeable way. One simulation is *Scram,* a nuclear reactor simulator sold by Atari. In *Scram,* a picture of the inner workings of a nuclear reactor is placed on the screen. The graphics are excellent. You can see the cooling fluid flowing through the pipes, and you can hear the turbines turning. You can also open and close valves to regulate the operation of the reactor. If you turn them in the wrong combination, you can cause a meltdown in the reactor. Periodic earthquakes which damage the reactor keep things interesting. It's obvious that the big advantage of a simulation is the chance to learn by doing without having to live (or die!) with your mistakes.

Study courses essentially use the computer to make an audio-visual presentation of a subject. Atari markets courses in French, German, Italian, and Spanish, and other courses in programming your Atari. Most of these courses use the program recorder to present the course with a sound track on the cassette. Dorsett Software offers an extremely wide variety of study courses, ranging from reading development to digital electronics. If you want to learn about advanced programming on your Atari, Educational Software offers *Tricky Tutorials,* which come on disk and include programming examples of how to create advanced video graphics.

Telecommunications

If you own a modem, you'll need telecommunication software to run it. This software must be able to control the 850 Interface Module, which sets the baud rate and other important factors that the modem will need to operate correctly.

Two excellent telecommunication programs are *TeleTalk* by DataSoft, and *TeleTari* by Don't Ask Software. Both give you full control over the settings of the 850 Interface Module, and display incoming text on the monitor. They also allow you to save received text on disk for later perusal, and send files stored on disk over the phone lines. In addition, TeleTari lets you store passwords, phone numbers, and modem settings for different computers you might connect to, so that you don't have to reenter them each time you use the program.

UTILITIES

Utilities are not written to accomplish any particular task, but are meant to help you get better use out of your computer. There are all sorts of utility programs available, and we'll look at several of them.

BASIC Utilities

There are many utilities that help you use Atari BASIC. One of them is *Monkey Wrench,* sold by Eastern House Software, which deserves mention in part because it's the only program on a cartridge for the right-hand slot of the Atari 800. *Monkey Wrench* provides many convenient features for the BASIC programmer, which include automatic line numbering, line renumbering, line deletion over a specific range, and hexidecimal/decimal conversion. It will also reset screen margins easily, and will make the cursor keys work without using the CONTROL key. It has a memory test package, and a machine language monitor for machine language programmers. If all the above terms read like gibberish to you, then you probably don't need *Monkey Wrench*. Experienced programmers, however, will find it a very useful time-saving tool.

Graphics Software

The Atari computer probably has the best home computer graphics on the market, capable of astonishingly fine pictures for a microcomputer. Unfortunately, most of the advanced graphics which make these fine pictures possible are not possible to create easily using BASIC. It's not surprising, then, that there are many Atari utilities to help you create graphics on the Atari.

There are several programs available which let you design your characters (fonts) on the screen. This gives you the capability of using Greek or Cyrillic characters, or perhaps creating special scientific symbols.

Other graphics utilities concentrate on creating complex and colorful pictures easily on screen. One of the best of these is *Micro Illustrator*, which comes with the KoalaPad touch pad. It gives you the ability to "paint" on your screen, with a wide selection of brushes and colors. It also creates circles, boxes, and straight lines very easily for those of us with less than amazing artistic ability. Other similar programs are *Graphic Master*, by DataSoft, and *Fun With Art*, by Epyx, Inc.

Graphic Master will print out your screen images in black and white on your printer, if you have the proper printer. If you want them in color, DataSoft also makes *Color Print*, which uses color carbon papers to turn your printer into a color printer.

Music Software

The Atari computer is capable of producing four voices of sound over a three octave range. *Music Composer* is a program by Atari designed to help you use these voices to create music. You need to understand music notation to use it, but if you do, you can enter notes and rests easily on a staff to create the melodies you want. The *Music Composer* will play your compositions back to you in up to four part harmony, displaying the music on the screen as it is played.

Disk Utilities

There are several utilities that help you deal with disk storage. Some of them will keep a record of all the files you've stored on your disk collection for easy location, others help you deal with faulty disks and lost files. *Diskey* is a utility from Adventure International which helps you retrieve files lost on disk. It lets you look closely at the code in each sector of information on the disk. If you have accidentally deleted a file, *Diskey* will sometimes allow you to restore the file by piling up its remains. It will also let you repair damaged files that will not load, and copy oddly formatted disks. It's not for the beginning user, but is very useful for the disk user who knows what he or she is doing.

COMPUTER LANGUAGES

The Atari is a multi-lingual computer—that is, it can use many different computer languages for you to do your programming. The standard language, of course, is Atari BASIC, but there's a variety of other languages available for your specific programming needs.

LOGO

LOGO is an alternative to programming in BASIC, and is easier in many respects, as it's structured to follow the thought structures that humans tend to use to solve problems. One of its best and most entertaining features is *turtle graphics*, a simple method of creating sophisticated drawings by giving crawling orders to a small turtle with a "pen" on the screen. LOGO is often the language of choice for teaching programming techniques to children. Atari sells Atari LOGO, which has the capability of putting four turtles on the screen.

Microsoft BASIC

Microsoft BASIC is the dialect of BASIC used on Apple, Commodore, and Radio Shack computers. It has several useful features not included in Atari BASIC. One of these is advanced string-handling capabilities (the ability to handle text easily). Line renumbering and ranges of line deletion are available, as well as advanced input/output capabilities, which make using the disk drive and other peripherals easier. Additional printer commands are included, and one extremely powerful feature is the ability to define your own commands. Many people use Microsoft BASIC to easily translate programs from other computers which also use Microsoft BASIC. It uses 16K of memory, and is sold on cartridge by Atari.

PILOT

PILOT is a simple language designed for children and computer novices. It's essentially pared-down BASIC which uses one- and two-letter commands that don't demand extensive typing skills. Like LOGO, it also features turtle graphics. PILOT is easily learned, and its pleasing graphics capabilities make it an excellent language with which to introduce a novice to programming. Atari sells PILOT on cartridge for under $80.

Other Languages

For the sophisticated programmer, there are a number of superior programming languages available for the Atari. These include Assembly, C, FORTH, LISP, and Pascal.

GAMES

Games on home computers are often mentioned as an embarassed afterthought, as if they represented a trivial waste of a computer. But software sales records and a look at almost anyone's software library will quickly dispel that notion. More game programs are sold than any other type of software. So many games are available for the Atari, that we can only examine the major types of games.

Arcade Games

Arcade games are the most popular type of game on the Atari, because of the excellent graphics available. They require a quick eye and fast reflexes. They are usually shoot 'em up games, where you control the firing motion with a joystick, or maze games, where you maneuver a character through, avoiding dangers and seeking out rewards. The granddaddy of all Atari computer arcade games is Atari's *Star Raiders;* its excellent feel of play and its realistic feeling of motion made it an addictive breakthrough in gaming.

Strategy Games

Strategy games are usually adapted from popular board or card games. A home computer is very good at dice shaking, minding a bank, checking for rule infractions, and other tedious tasks. If you can't find other players, the computer will play against you, sometimes too capably. There are versions of popular board games such as chess, checkers, and backgammon, and of card games like cribbage, bridge, blackjack, and poker.

War games work very well on a home computer, since the computer will calculate and keep track of all the odds necessary for play. A classic of war game programming is *Eastern Front,* sold by Atari, where you control the German army invading Russia in 1941 (see Plate II on inside back cover). The computer controls the Russian forces and puts up a very good fight.

Adventure Games

Adventure gaming is an exclusive game genre of the computer. You control the central character, telling him, her, or it, where to move, what to look at, what to pick up, and what to say. Many adventure games are presented entirely in text, which, as you move from location to location, describes your surroundings to you. Usually, you have a goal to accomplish, a rescue, treasure to find, or merely staying alive. The first and classic adventure game known, appropriately enough, as *Adventure,* is sold by Compu-ware. Other classics are the Infocom adventure series, including *Zork I, II,* and *III,* and the Scott Adams adventures, sold by Adventure International. Some adventure games are now written with pictures displaying the surroundings. DataSoft makes several, including *Sands of Egypt* (see Plate III on inside back cover), and *Dallas,* an adventure based on the popular TV show.

APPENDIX

This appendix is a quick and easy reference to loading programs on Atari computers. Keep in mind that the cartridge slot and power switch location varies from model to model. The cartridge slot on the 400, 800, 600XL, and 800XL computers is right on the top of the console (under an opening hatch on the 400 and 800). The slot on the 1200XL is located on the left side. The power switch is on the right side of the 400 and 800 (a rocker switch, not to be confused with the channel selector switch, which is a sliding switch). The power switch is on the left side of the 1200XL, and to the left rear of the 600XL and 800XL.

LOADING A CARTRIDGE PROGRAM

1. Start with the computer turned off.
2. Make sure monitor or TV is turned on.
3. Open cartridge door (for 400 and 800 computers only).
4. Insert cartridge in slot (label side up in 1200XL computers, label side forward in the others.) Use the left hand slot of the 800 computer.
5. Close cartridge door.
6. Turn on computer.

To change cartridges, first turn off the computer, then repeat these steps.

LOADING A CASSETTE PROGRAM

We'll discuss two different kinds of cassette programs: autoboot programs and BASIC programs. BASIC programs must have the BASIC cartridge inserted before loading, autoboot programs usually require that the cartridge slot is empty.

Autoboot Programs

1. Start with the computer turned off.
2. Make sure cartridge slot is empty.
3. Make sure monitor or TV is turned on.
4. Insert cassette, label side up, in recorder.
5. Rewind tape to beginning.
6. Hold the START button down (in the top strip of the 1200XL, to the far right of the other models.) If you have a 600XL or 800XL computer, hold the OPTION key down as well.
7. While holding down the START button, turn on the computer.
8. When the computer buzzes once, release the START key and depress the PLAY button on the cassette recorder.
9. Press the RETURN key on the right side of the computer keyboard.
10. After the program is loaded (when something finally appears on the screen), depress the STOP key on the cassette recorder.

If the program doesn't load, it may be an autoboot program that needs BASIC to interpret it. If you have a 600XL or 800XL, merely repeat the steps above without holding down the OPTION key. If you have a 400, 800, or 1200XL computer, replace step 2 with:

2. Insert BASIC cartridge, make sure the cartridge door is closed on the 400 and 800.

BASIC Programs

1. Follow the instructions for loading a cartridge to load the BASIC cartridge. (Skip this step if you have a 600XL or 800XL computer.)
2. Insert cassette, label side up, in recorder.
3. Type CLOAD and then press the RETURN key on the right side of the keyboard.
4. When the computer buzzes once, depress the PLAY button on the cassette recorder.
5. When the program has finished loading (READY will appear on the screen under CLOAD), depress the STOP key on the cassette recorder.
6. Type RUN and press the RETURN key, and the program should run.

There are three types of BASIC cassette programs. The instructions above are for the most common type. If the program will not load, and you get an error message on the screen, try replacing step 3 above with:

3. Type ENTER "C:" and then press the RETURN key.

If this doesn't load the program successfully either, then try:

3. Type LOAD "C:" and then press the RETURN key.

Loading a Disk Program

We'll discuss both autoboot programs and BASIC programs. BASIC programs must have the BASIC cartridge inserted before loading, while autoboot programs usually require that the cartridge slot is empty.

Before starting, one very important message: Handle the disk with care, and only by its outer cover. Don't touch the exposed surface through the slots or bend the cover.

Loading an Autoboot Program

1. Start with the computer turned off.
2. Make sure cartridge slot is empty.
3. Make sure the monitor (or TV) and the disk drive is turned on.
4. If the BUSY (upper) light is off on the drive, open the door or latch and insert the disk label side up, exposed slot toward rear of drive.
5. Close the drive door or latch.
6. Turn on the computer. If you have a 600XL or 800XL computer, hold the OPTION key down while you do this.
7. The program will load, and the disk drive will turn itself off. Remember never to open the drive door unless the BUSY light is off.

Some autoboot programs require the BASIC cartridge to run. If the program won't load or you get a display that says Disk Operating System or DOS, then try again, but don't hold down the OPTION key if you have a 600XL or 800XL computer. For the 400, 800, and 1200XL computer, try again substituting this step for instruction 2.

2. Insert BASIC cartridge, make sure cartridge door is closed on 400 and 800 computers.

Loading a BASIC Program

1. Start with the computer turned off.

2. Insert BASIC cartridge. Make sure door is closed on 400 and 800 computers. Ignore this step if you have a 600XL or 800XL computer.
3. Make sure monitor (or TV set) and disk drive are on.
4. Find the Atari Master Diskette, or any other disk that has DOS on it.
5. If the BUSY (upper) light is out on the disk drive, open the door or latch and insert the disk label side up, exposed slot toward the rear of the drive.
6. Close disk drive door or latch.
7. Turn on the computer.
8. After BUSY light has gone out on disk drive, open disk drive and remove Master Diskette.
9. Insert disk containing BASIC program.
10. Close drive door or latch.
11. Type RUN "D: followed by the name of the program you want loaded, then hit the RETURN key.

If you get BOOT ERROR on the screen after step 8, you probably don't have a disk with DOS in the drive, or the drive door isn't closed. If so, insert the correct disk, close the door, and try again. If step 11 won't load the program, try:

12. Type ENTER "D: followed by the name of the program you want loaded, then hit the RETURN key.
13. When READY appears on the screen, type RUN and hit RETURN.

If a program won't load after following these instructions, then refer to your owner's manual.

Turning Off the Computer System

1. If BUSY light is off, remove disk from disk drive and close door.
2. Turn off disk drive, monitor and computer.
3. Make sure the STOP key of the cassette recorder has been depressed.

GET ON THE ALFRED COMPUTER MAILING LIST!

KEEP UP-TO-DATE!

Send us your complete name and address and we'll send you catalogs, newsletters, and new product listings, as they become available.

Or fill out and mail this coupon.

Name

Address

City State Zip

Handy Guide Titles You Own

Comments: ______________________________

Send to: ALFRED PUBLISHING CO., INC.
Post Office Box 5964
Sherman Oaks, California [illegible]

5344

Alfred Handy Guides

Practical, economical, and concise
Alfred Handy Guides tell you what you need to know quickly and easily—without a lot of reading!

"A busy executive or professional who feels the need for a crash course in the subjects covered by the **Handy Guides** *would do well to pick up a few on the way to the commuter train or the airport"* Personal Computing Magazine

The Alfred Handy Guide Series to Computers

How to Buy a Personal Computer
How to Buy a Portable Computer
How to Buy a Word Processor
How to Choose a Computer Camp
How to Make Money with Your Personal Computer
How to Use Atari Computers
How to Use the Apple IIe
How to Use the Coleco Adam
How to Use the Commodore 64
How to Use the IBM PC
How to Use the IBM PCjr
How to Use the TRS-80 Model 100 Portable Computer
How to Use VisiCalc/SuperCalc
The Personal Computer Glossary
Quick and Easy dBase II
Quick and Easy Wordstar
Understanding APL
Understanding Apple Basic
Understanding Apple Graphics
Understanding Artificial Intelligence
Understanding Atari Graphics
Understanding BASIC
Understanding COBOL
Understanding Commodore 64 Basic
Understanding Commodore 64 Graphics
Understanding Computer Crime
Understanding Computer Graphics
Understanding Computer Information Networks
Understanding CP/M
Understanding Data Base Management
Understanding Data Communications
Understanding Electronic Mail
Understanding FORTH
Understanding FORTRAN
Understanding LISP
Understanding LOGO
Understanding Microcomputer Hardware
Understanding Pascal
Understanding Robots
Understanding Software Law

Look for new titles and new series.
For more information:

Alfred Publishing Co., Inc.
15335 Morrison St.
P.O. Box 5964
Sherman Oaks, CA 91413

ISBN 0-88284-323-0

0 38081 00295 00323